ESSAYS IN CORPORATE FINANCE AND CORPORATE GOVERNANCE

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ESSAYS IN CORPORATE FINANCE AND CORPORATE GOVERNANCE

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My dissertation contains three essays in corporate finance and corporate governance. The first essay studies the effect of information frictions across corporate hierarchies on internal capital allocation decisions, using the Sarbanes-Oxley Act (SOX) as a quasi-natural experiment. SOX requires firms to enhance their internal controls to improve the reliability of financial reporting across corporate hierarchies. I find that after SOX, the capital allocation decision in conglomerates is more sensitive to performance as reported by the business segments. The effects are most pronounced when conglomerates are prone to information problems within the organization and least pronounced when they still suffer from internal control weaknesses after SOX. Moreover, conglomerates' productivity and market value relative to stand-alone firms increase after SOX. These results support the argument that inefficiencies in the capital allocation process are partly due to information frictions. My findings also shed light on some unintended effects of SOX on large and complex firms.

The second essay is co-authored with Yaniv Grinstein and investigates how firms tie CEO compensation to performance. We take advantage of new compensation disclosure requirements issued by the Securities and Exchange Commission in

2006. Firms vary in their choice of performance measures and horizons, and in their reliance on pre-specified goals. Consistent with optimal contracting theories, we find that firms choose performance measures that are more informative of CEO actions, and rely less on pre-specified goals when it is more costly to contract on CEO actions.

The third essay investigates the design of division managers (DMs) incentive contracts again taking advantage of the disclosure requirements. I find that firms do not use relative performance evaluation across divisions and that in general most of DM compensation incentives are associated with firm performance instead of division performance. Furthermore, division performance-based incentives tend to be smaller in complex firms, when within-organization conflicts are potentially more severe. I also find that when the probability of promotion to CEO is lower, DM ownership requirements are more stringent and DM compensation incentives are greater. These results support notions that influence costs as well as promotion-based incentives are important considerations in designing DMs contracts.

BIOGRAPHICAL SKETCH

David De Angelis was born in Strasbourg, France. He received a bachelor's degree in Business Administration from HEC Montréal, Canada, a master's degree in Economics from the University of Montréal, Canada, as well as a master's degree in Finance from Cornell University, Ithaca, NY.

To the three women in my life,

my mother, my sister and my wife

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CHAPTER 1

ON THE IMPORTANCE OF INTERNAL CONTROL SYSTEMS IN THE CAPITAL ALLOCATION DECISION: EVIDENCE FROM SOX

"*Once they have stopped fulminating, many bosses privately admit that SOX has brought benefits. Managers are now far more confident about the quality of the numbers they get from their business units.*"

The Economist, Smelly Old SOX, July 26, 2007

1.1 Introduction

In his presidential address to the American Finance Association, Jensen (1993) underlines the failure of firms' internal control systems and the presence of information problems that lead firms to adopt sub-optimal corporate policies. Indeed, the efficiency of one of the most important corporate decisions, how to allocate resources within the organization, is predicted to be particularly sensitive to information quality and reliability (see, e.g., Harris and Raviv, 1996).[1] Yet there is little empirical evidence on the importance of information frictions in the internal capital allocation process as well as on the effects of internal control systems on internal capital allocation decisions.[2]

[1] Most previous findings suggest that internal capital allocations are inefficient: conglomerates tend to over-invest in their weakest divisions at the expense of under-investing in their strongest divisions (e.g. Shin and Stulz, 1998, Scharfstein, 1998, Rajan, Servaes and Zingales, 2000, and Ozbas and Scharfstein, 2010), and there exists some rigidity in the process of allocating resources across divisions (Ozbas and Zelvili, 2009).

[2] Schoar (2002) underlines the needs for further exploration on the interaction of internal corporate governance and corporate decisions.

This paper aims to examine the effect of information frictions across corporate hierarchies on internal capital allocation decisions. I exploit the Sarbanes-Oxley Act (SOX) as a quasi-natural experiment of a shock to the level of information frictions across corporate hierarchies. The Act was enacted on July 30th, 2002, after a sequence of high-profile corporate scandals (Enron, Worldcom etc.). SOX requires firms to enhance their internal control systems in order to improve the reliability of financial reporting within the organization.[3] Section 404 requires firms to adopt procedures to test internal controls over their financial reports as well as to employ an independent auditor to assess the effectiveness of these procedures and the firm's internal controls. Section 302 increases the responsibility of signing officers with respect to the accuracy of financial reports and the effectiveness of internal controls. Section 906 allows criminal charges in case of misleading or fraudulent reports. SOX also created the Public Company Accounting Oversight Board (PCAOB) which oversees auditing firms.

I conduct my analysis in a number of steps. First, I study how internal capital allocation decisions change after SOX in a sample of conglomerate firms.[4] I find that after SOX there is less rigidity in allocating resources within the organization

[3] In the context of SOX, the Securities and Exchange Commission (SEC) defines internal controls as a set of procedures that provide reasonable assurance that financial reporting is accurate. These procedures, for instance, include the maintenance of records that accurately and fairly reflect a firm's transactions.

[4] In this paper, a firm is classified as a conglomerate if it has multiple business segments, while it is classified as a stand-alone firm if it has only one business segment. When studying the internal capital allocation decision per se, I restrict my sample to only conglomerates (I need firms with at least two business segments to identify how firms allocate capital within the organization). However, when studying the efficiency of the internal capital allocation process, I include both conglomerate and stand-alone firms in my sample.

– the dispersion of investment across business segments within the firm increases after SOX. In addition, top executives rely more on internal financial reporting in their capital allocation decisions. I find that the allocation decision is more responsive to performance as reported by the business segments. Before SOX, the sensitivity of investment to segment performance is not significant, while it is after SOX. After SOX, firms tend to invest more in their best-performing segments while before SOX they were more inclined to subsidize their worst-performing segments. In other words, as illustrated in the quote above from *The Economist*, after SOX top executives are more confident about the quality of the numbers they get from lower-level managers and thus will rely more on them when making their capital allocation decisions.

Second, I study whether these changes of behavior vary across conglomerates based on their tendency of having information problems across corporate hierarchies. I find that conglomerates with more business segments are more affected by SOX: their sensitivity of investment to segment performance increases significantly more than conglomerates with fewer segments. Due to limitation in acquiring specific knowledge (Jensen and Meckling, 1992), information problems within the organization are conjectured to be more severe for firms with more business segments. These firms tend to be more complex and require more information gathering than firms with fewer business segments. It is also more costly for firms with more segments to audit and verify numbers from segments as well as to monitor them (Stein, 1997). In addition,

conglomerates that had restated their financial reports in the past also exhibit large increase in sensitivity of investment to performance. Restatement is a signal of less reliable internal financial reports and weaker internal controls; therefore, I expect these firms to be more affected by SOX.

I also collect information about the auditor's opinion on the effectiveness of firm's internal controls. For conglomerates, the auditors of which report material weaknesses in their internal controls, I find no significant change in allocation behavior after SOX. In addition, these conglomerates exhibit a negative sensitivity of investment to segment performance in the all sample period, which confirm the importance of internal controls: when internal controls are weak, firms tend to not rely on internal financial reporting in their capital allocation decisions. These results across conglomerates suggest that the effects of SOX are most pronounced in conglomerates that are prone to information problems across corporate hierarchies and least pronounced in conglomerates that still suffer from material weaknesses in their internal controls after SOX.

Third, I study the impact of SOX on the efficiency of the internal capital allocation process by investigating how conglomerates' operating performance and market value relative to stand-alone firms change after SOX.[5] Consistent with Schoar (2002), I observe that, on average, conglomerates exhibit better operating

[5] Giroud (2010) shows that information within the firm is important in a firm's productivity and the investment decision. However, the scope of his study is different than this paper. He focuses on the role of soft information (in his framework, SOX would represent a shock on "hard" information) and investigates the effects of the introduction of new airline routes on the level of investment and productivity of firms' plants.

performance than stand-alone firms. Using a difference-in-differences methodology, I find that this productivity advantage of conglomerates over stand-alone firms significantly increases after SOX and is more pronounced for conglomerates with more segments. In addition, the effects of SOX on productivity also vary within the conglomerate. Smaller segments within the organization tend to be more affected by SOX. To the extent that smaller segments in the firm are likely to be younger ones and that the CEO has less knowledge about them; I expect that information problems should be more severe for smaller segments and, thus, these segments should be more affected by SOX. Moreover, due to limitation in acquiring specific knowledge, CEOs are likely to focus on the core-business of the firm, that is, the larger segments (Ozbas and Selvili, 2009).[6]

Consistent with past findings, conglomerates tend to be traded at a discount compared to stand-alone firms (e.g. Lang and Stulz, 1994, Berger and Ofek, 1995). However, I find that the conglomerate discount decreases significantly after the announcement of SOX and remains at a lower level in the following years. These results regarding conglomerates' operating performance and market value relative to stand-alone firms support the notion that internal capital allocation process is more efficient after SOX. To the extent that information about segment performance improves as a result of SOX, one should observe more efficient

[6] Some recent papers show that social ties matter in the capital allocation decision. While Duchin and Sosyura (2011) find that segment managers with social ties to the CEO tend to receive more

allocation of capital across business segments and, by the same token, the value conglomerates' internal capital markets should increase.

Since these new internal control systems improve firm efficiency, it is puzzling that firms did not adopt them on their own prior to SOX. The most plausible explanation is that these internal governance mechanisms were not available (e.g. increased penalty if caught, auditors are now more risk averse and will scrutinize more carefully accounting reports, etc.). These new mechanisms improve the effectiveness of internal control systems and, thus, mitigate information asymmetry across corporate hierarchies. The fact that firms were not able to alleviate these information problems and needed new incentive tools supports the argument that inefficiencies in the allocation process are partly due to the presence of information and agency problems within the organization.

My findings support predictions from the theory. A model by Harris and Raviv (1996) suggests that one should observe less rigidity in the capital allocation process and higher reliance on information reported by the division managers following improvements in the effectiveness of internal auditing procedures and an imposition of a higher level of auditing (which grant to the management greater ability to verify information received from their divisions and more reliable information). As a result, internal capital allocation decisions should be more efficient (i.e. closer to the first-best solution). My findings are also

capital, Xuan (2009) shows that CEOs favor segments in which they do not have strong connections to enhance their influence over them.

consistent with Scharfstein and Stein (2000), who show that lobbying activities among division managers would lead to inefficiencies in internal capital markets. After SOX, the firm has access to a stronger set of internal corporate governance mechanisms that aim to mitigate information problems and conflicts of interest within the organization. After SOX it is more difficult for the division managers to create opaque accounting systems and to hide information (i.e., the costs of lobbying increase) and, thus, internal capital allocations should be more efficient.

I employ various empirical tests to check the robustness of my results. Recent studies show that economic activities and access to external capital influence the performance and behavior of conglomerates firms relative to stand-alone firms (Dimitrov and Tice, 2006). It is therefore possible that my results are driven by changes in the economic activity in the United States around SOX. To address this issue, I check whether the business cycle influences my results by using different control periods (i.e., period before SOX) and selecting a pre-SOX period similar to the affected period (i.e., the period after SOX) in terms of business cycle. I find similar results as for my baseline specification test. I also run a placebo test using only the period before SOX and find no change in the capital allocation decision. My results, therefore, are robust to variations in the business cycle.

SOX and concomitant governance regulations in the New York Stock Exchange and NASDAQ are also likely to change the external monitoring environment and the transparency of publicly traded firms, and thus my results could be driven by the mitigation of agency conflicts between the management and the investors (or

board of directors). As shown in the model by Scharfstein and Stein (2000), both layers of asymmetric information problems and conflicts of interests (first layer: between top executives and investors (or board of directors); second layer: between the division managers and top executives) could influence the budgeting decision.[7] It is therefore possible that my results are driven by changes in the agency conflicts between management and shareholders. To address this concern, I check if variation in board composition and ownership structure across conglomerates can explain my results. I find that conglomerates for which board composition does not satisfy the board independence requirements before SOX do not exhibit significant changes in their capital allocation process compared to firms with complying boards. In addition, there is no significant influence of executive ownership or block ownership on the change of responsiveness of investment to performance. These results suggest that my results are not driven by changes in the external monitoring environment.

Methodologically, my paper circumvents endogeneity and self-selection problems.[8] Most previous empirical works base its analysis on cross-sectional variations and compares the investment behavior of conglomerates and stand-alone firms, whereas, I focus on the change of behavior within the conglomerate

[7] Previous findings suggest that when executive and block ownership are larger, internal allocations tend be more efficient (Scharfstein, 1998; Ozbas and Scharfstein, 2010; Sautner and Villalonga, 2010).

[8] See, for instance, Campa and Kedia (2002) and Graham, Lemmon, and Wolfe (2002) for evidence about the importance of these problems in studying the diversification discount.

around an exogenous shock.[9] In addition, past studies ground their conclusions on the relation between the allocation decision and Tobin's Q of the industry, whereas I base my analysis on the link between the allocation decision and past performance. Hence my conclusions are not affected by any potential measurement error in Q.[10] Furthermore, by basing my analysis on past performance across divisions, instead of industry Q, my empirical specification better captures actual business practices. Graham, Harvey, and Puri (2010) show that a large proportion of CEOs rely on past accounting return and divisional manager reputation, which to some extent is built on past performance, as well as on relative performance evaluation with respect to their capital allocation decisions. In addition, the focus on past performance (instead of industry Q) is also better suited to study the effects of SOX (i.e., it captures the change in the quality of internal financial reporting) as well as to test the theory (e.g., Harris and Raviv, 1996).

This study contributes to the existing literature in several ways. First, my results suggest that inefficiencies in the capital allocation process are partly due to information frictions across corporate hierarchies. To explain inefficient internal capital allocations, one general theme in the theoretical literature is to emphasize the presence of within-firm frictions in the allocation decision, such as information asymmetry and conflicts of interests across corporate hierarchies

[9] Among notable exceptions are Lamont (1997), who uses the 1986 oil price shock; Campello (2002), who investigates the effects of the Fed monetary policies on the internal capital markets of financial conglomerates; and Sautner and Villalonga (2010), who use a tax change in Germany.

(e.g., Harris and Raviv, 1996, and Scharfstein and Stein, 2000). However, few empirical papers have looked into the link between internal capital markets and within-firm frictions and thus it remains debatable whether these frictions have an important effect on internal capital allocation decisions.[11, 12] Therefore, the results of this paper confirm predictions from a wide range of models that use within-firm frictions to explain inefficiencies in internal capital markets.

Second, consistent with the arguments in Jensen (1993), my findings shed light on the importance of internal control systems in the efficiency of corporate decisions. In addition, this study is one of the first attempts to investigate the effects of internal corporate governance on capital allocation decisions.

Finally, this paper complements our understanding of the costs and benefits of SOX. By focusing on the effects of SOX within the firm and identifying the channel of value-creation, this paper reveals the impact of SOX from a new perspective. Since large firms are more likely to have multiple divisions and, thus, are more prone to information problems within the organization, this study provides

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[10] Whited (2001) shows that internal capital allocations are no more inefficient once one is using a measurement-error-consistent estimator.

[11] As pointed out in Ozbas and Scharsftein (2010), one of the main challenges to assessing the influence of these within-firm frictions in the allocation decision is the lack of data about the inner workings of the firm.

[12] Two recent studies use proprietary data on one specific organization and show that influential power within the organization matters in the capital allocation decision. Cremers, Huang and Sautner (2010) study a retail-banking group and show that banks with more voting power tend to receive more funds. See also Glaser, Lopez de Silanes, and Sautner (2011) who use proprietary data from a multinational conglomerate.

additional explanations for why large firms benefit more from SOX than do small firms.[13]

The paper continues as follows. Section 1.2 describes main provisions of the Sarbanes-Oxley Act as well as reviews existing evidence about the effects of the Act. In Section 1.3, I develop the main hypotheses. Section 1.4 explains the database construction. Section 1.5 provides the empirical analysis and Section 1.6 investigates the robustness of the results. Section 1.7 concludes and discusses the findings in light of the past results about the impact of SOX.

1.2 The Sarbanes-Oxley Act: Description and Evidence

1.2.1 Description

The Sarbanes-Oxley Act (SOX) was enacted on July 30, 2002. The most prominent provision is Section 404, which requires management to adopt procedures to test internal controls over a firm's financial reports and to assess the efficiency of these procedures (404a). In addition, firms are required to have an independent auditor that assesses the effectiveness of those procedures and internal controls (404b). Section 404 went into effect on November 15, 2004. Firms were required to provide the Management's Annual Report on Internal Control over Financial Reporting and the Attestation Report of the Registered Public Accounting Firm with their 10-K filling if their fiscal year ended on or after November 15, 2004. However, small public firms had a stay of execution and were originally required

[13] Previous results show that SOX is more beneficial (less detrimental) to large firms (see Chhaochharia and Grinstein, 2007; Piotroski and Srinivasan, 2008; Iliev, 2010; and Kang, Liu, and

to comply with Section 404 on July 15, 2007.[14] Foreign firms were originally required to comply with Section 404 on the same date as domestic firms. However, the date was postponed to July 15, 2005 and finally to July 15, 2006. Section 302 increases the responsibility of signing officers with respect to the accuracy of financial reports and the effectiveness of internal controls. In addition, Section 302 recommends the use of sub-certification. Indeed, lower-level managers can be asked to certify the financial reports by signing an affidavit. The use of sub-certification is a powerful device made available to top management to increase the incentives of divisional managers to report truthfully. Section 906 allows criminal charges in cases of misleading or fraudulent reports. The charges can be up to 5 million dollars in fine and 20 years of prison. SOX also created the Public Company Accounting Oversight Board (PCAOB) which oversees auditing firms. Among its responsibilities, the PCAOB, for instance, sets new auditing standards in order to improve effectiveness of auditing procedures, regulates non-audit services that audit firms can offer to their clients, and monitors the independence of auditing companies.

The Sarbanes-Oxley Act contains additional provisions such as for more independence of auditors, expanded liability of officers and directors with respect to financial reporting, and a mandate to the SEC and stock exchanges to adopt new rules to strengthen corporate governance. Indeed after the enactment

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Qi, 2010).

[14] Small domestic and foreign public firms are defined as firms with a public float below 75 million dollars (non-accelerated filers according to the SEC definition).

of SOX, the NYSE and NASDAQ adopted new regulations concerning the composition and role of corporate boards. These new requirements are: boards should be composed of a majority of independent directors; enhanced definition of independent director; audit committee members should be financially literate and at least one member of the audit committee should have financial expertise; boards should hold meetings without the management; and the compensation, auditing and nominating committees should consist only of independent directors.

1.2.2 Review of the Evidence regarding the Impact of SOX

Previous results suggest that large firms tend to benefit more from the adoption of SOX than do small firms. Chhaochharia and Grinstein (2007) show that large (small) firms that are less compliant tend to earn positive (negative) abnormal stock returns.[15] Piotroski and Srinivasan (2008) find that after the SOX enactment the listing preferences between US and UK exchanges of large foreign firms do not change, whereas, small firms are less likely to choose a US listing (instead of a UK one).[16] Comparing US and UK firms, Kang, Liu, and Qi (2010) show that after SOX US firm managers employ a larger discount rate in their investment decision, while UK firms do not change their discount rate. They also find that this effect is more significant among small firms.

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[15] Hochberg, Sapienza, and Vissing-Jorgensen (2009) find consistent results with the argument that SOX would reduce agency problems. They find that firms for which insiders lobbied against SOX exhibit higher cumulative stock returns during SOX passage than non-lobbying firms.

[16] There is some evidence that overall the costs associated to the adoption of SOX outweigh the benefits—Zhang (2007) finds significant negative abnormal returns around key SOX events for US-traded stocks versus foreign non-US-traded stocks.

Existing studies find support that SOX enhances transparency between the firm and the investors. Arping and Sautner (2010) find that following the implementation of SOX analyst forecasts errors and dispersion decrease. Jain, Kim, and Rezaee (2008) observe that measures of stock liquidity increase after the act, and that the improvement in liquidity is associated with better quality of financial reports. Indeed, Iliev (2010) shows that Section 404 leads to more conservative earnings reports. In addition, Michaely, Rubin, and Vedrashko (2011) find that after SOX earnings announcements are more likely to occur outside the trading hours. They conclude that SOX levels the playing field among small and large investors by allowing more time for investors to digest the news before trading and thus induces more fairness and transparency with respect to the dissemination of new information.

Moreover, some results suggest that SOX has an effect on corporate decisions and management's attitude toward risk. Bargeron, Lehn, and Zutter (2010) find that after the Act, managers tend to be more cautious in their corporate decisions. Unlike UK firms, US firms tend to decrease their research and development expenses and capital expenditure, as well as to increase their cash holdings after SOX.

Finally, using a web-based survey launched by the SEC of 3184 corporate insiders on the benefits of Section 404, Alexander et al. (2010) document that insiders tend to perceive that Section 404 has improved internal controls and confidence in firms' financial reporting (i.e., decrease of information asymmetry) especially

for large and complex firms.[17] However, they also find that insiders tend to perceive no impact on the ability to raise capital and on firm stock liquidity. Furthermore, there is large heterogeneity in opinions about the effects on the efficiency of firms' operations: 27.7% of insiders report a negative impact; 42.9% no impact; and 29.4% a positive impact. Overall, these results suggest that SOX has improved the effectiveness of internal control systems and the reliability of financial reporting.

1.3 Development of the Hypotheses

The aim of this paper is to shed light on the effect of information problems on internal capital allocation decisions.[18] I use a mandatory change in internal control systems which mitigates information problems across corporate hierarchies. In this section, I review theoretical studies and develop the main hypotheses that guide the empirical design of the paper.[19]

A typical agency conflicts model assumes asymmetric information and conflicts of interests between the principal and the agent (e.g., Holmstrom, 1979; Harris and Raviv, 1996). The principal wants to provide the right incentives to the agent in

[17] Dyck, Morse, and Zingales (2010), find that after SOX auditors become an important player in detecting fraud in firm's activities, which also supports the argument that internal controls are more effective after SOX.

[18] Since the scope of this paper is the capital allocation decision, I abstract from the decision of the firm to diversify its activities and consider only conglomerate firms when I study the capital allocation decision. However, there are rationales for a firm running multiple divisions. For instance, compared to stand-alone firms, conglomerate firms might be able to raise more external capital. If the divisions' cash-flows are not perfectly correlated, as the number of divisions increases, the volatility of a firm's total cash-flows decreases and, thus, a conglomerate firm would be able to raise more funds (Lewellen, 1971; Stein, 1997).

[19] See Maksimovic and Phillips (2006) and Stein (2003) for a review of the literature on internal capital markets.

order that the agent will pursue the principal's interests (e.g., makes effort and adopts policies that maximize firm value). In a firm with many divisions, there exist two layers of tensions. The first one is between the shareholders and the CEO, and the second one is between the CEO and the division managers.

Harris and Raviv (1996) study the optimal capital allocation process with the presence of information and incentives frictions between the CEO and the division managers. In their model, division managers report the capital needs of the division and the CEO decides how much capital each division will receive. However, division managers have private information about the true productivity of capital (i.e., the true capital needs) of their divisions (*specific knowledge*) as well as empire-building preferences.[20] Without a mechanism to elicit truthful revelation, division managers would have incentives to report a higher productivity. Harris and Raviv (1996) include the possibility for the CEO to audit the division at a certain cost and thus to learn about the true productivity (and penalize the division manager if he or she lies).[21] According to the Revelation Principle, division managers report truthfully in equilibrium. Harris and Raviv show that the optimal capital allocation scheme will involve an initial capital spending limit. However, division managers can request larger allocation. The initial capital spending limit is large relative to first-best in order to encourage

[20] A division manager has incentives to overinvest to a build larger division in which he or she can derive more utility, e.g., perks, compensation, reputation, and influence (Jensen and Meckling, 1976; Jensen, 1986).

[21] There are other papers that show how capital allocation process with additional mechanisms will elicit truthful reporting. See Harris and Raviv (1998) using also costly auditing, and Bernardo,

the division manager to not request more capital when the true productivity is low (and so the firm avoids the auditing cost). Thus, conglomerates will overinvest in divisions with low productivity. If the division manager requests additional funds, the CEO may allocate a compromise level of capital, or the CEO can audit the division (the probability of auditing increases with the amount of capital requested) and then allocate the amount requested (if the productivity is reported truthfully). For an unaudited request, the allocation is low relative to first-best and, so, there is underinvestment in high-productivity divisions. Harris and Raviv also show that as the cost of auditing decreases, the initial capital spending limit decreases, and the capital budgeting process becomes less rigid (CEO is more likely to approve new requests and the compromise allocations increase). This implies that the CEO places more importance on information reported by the division managers and capital allocation becomes more efficient.

Relaxing the assumption that the CEO has aligned incentives and, so, in the context of the two layers of agency conflicts, Scharfstein and Stein (2000) show that lobbying from the division managers to get more capital will lead to inefficient capital allocations. In their model, the CEO decides how much capital to allocate in each division and how much cash to give to the division managers (the division managers can be compensated by either cash or an inefficiently large capital allocation). Both the CEO and the division managers act in their own interest and derive private benefits. The division manager can spend time on

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Cai, and Luo (2001, 2004), using incentive contracts. Ozbas (2005) shows that the rigidity in the

productive effort for the firm and time on activities that will allow him or her to gain bargaining power against the CEO, but that is not productive for the firm (e.g., spending time increasing his or her visibility, creating opaque internal accounting systems, hiding information to make it harder to replace him or her). Since the division managers have a constraint on the amount of time they can devote to both types of activities, there will be a cost associated with lobbying activities and this cost will increase with division investment opportunities. Therefore, it is optimal for the CEO to over-compensate the division managers of weak divisions to alleviate their lobbying behavior. However, the CEO prefers to compensate them by allocating more capital to their division, rather than by paying cash, because the CEO derives more private benefits from cash (Jensen, 1986). Thus, Scharfstein and Stein (2000) predict that conglomerates will overinvest in weaker divisions due to both levels of agency conflicts (the rent-seeking behavior of the division managers and the misaligned incentives of the CEO).[22]

SOX improves the effectiveness of internal auditing procedures and imposes a higher level of auditing. In the Harris and Raviv model, SOX would be interpreted as a positive shock to management's ability to verify information received from their divisions (i.e. it is less costly to learn the true productivity of the segment

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capital budgeting process will be stronger in diversified firms.

[22] Rajan, Servaes and Zingales (2000) also study the importance of power struggles within the firm in capital allocation decisions. They show and find that when divisions have different investment opportunities (i.e., the firm is more diversified) the CEO will allocate more capital to the weaker divisions to alleviate the rent-seeking behavior of the division managers and increase

after SOX). Therefore, we should observe higher responsiveness of investment to information reported by the division managers.

At the same time, productivity reported by other divisions within the firm will also be more informative of their true productivity. Therefore, after SOX, the CEO will rely more on other segments' productivity and will decrease segment allocation if the other segments are doing better. Models based on the influence of the division manager (e.g., Scharfstein and Stein, 2000) show that firms should assign positive weight on other segments' reported productivity in their budgeting decision to increase the cost of lobbying by division managers. Since after SOX, influence of division managers is expected to decrease, the sensitivity of segment investment to other segments' profitability will decrease.

> *H.1.1: After SOX, the internal capital allocation decision will be more responsive to division productivity reported by the division managers. The sensitivity of segment investment to other segments' reported productivity will decrease, that is, there will be more relative performance evaluation across a firm's divisions in the allocation decision.*

Rigidity in the allocating process will lead the firm to under- (over-) invest in high (low) productive divisions (Harris and Raviv, 1996). Since SOX improves the effectiveness of internal auditing procedures and the reliability of internal financial reporting across corporate hierarchies, the capital allocation process

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the incentives to behave more cooperatively. However, they assume that the CEO has aligned

will be less rigid and thus more efficient after SOX. In addition, SOX leads to a decrease in the lobbying power of division managers (Scharfstein and Stein, 2000). After SOX, it is more difficult for the division manager to create opaque internal accounting systems and to hide information to make it harder to replace him or her.[23] Therefore, there will be less transfer of resources from the more productive segments to the less productive segments (subsidization) and more winner-picking behavior after SOX.

> *H.1.2: After SOX, the internal capital allocation decision will be more efficient and thus will lead to higher subsequent performance. The internal capital markets of conglomerate firms will create more (destroy less) value.*

1.4 Data

From 1976 to 1997, the Statement of Financial Accounting Standards 14 (SFAS 14—Financial reporting for Segments of a Business Enterprise) requires public firms to report financial data for every distinct line of business that accounts for more than 10% of a firm's total sales, profits, or assets. Distinct line of business was defined as business activity in a different 4-digit SIC code than the primary firm's activities. In December 1997, SFAS 131 was implemented and superseded SFAS 14. Under SFAS 131, firms need to classify and report segments according to the primary breakdown used by the management in defining segments for operating performance evaluation. The sample period of this study is included in

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incentives.

the post-1998 period and, thus, does not suffer from any misclassification of segments due to the change of regulation. In addition, SFAS 131 is of particular interest to this study since it requires firms to report segments according to their internal organization and, therefore, will lead to more precise estimates of firm decisions. Rajan, Servaes and Zingales (2000) make a similar argument and support the *management approach* of SFAS 131; however, the new rule was implemented too late for their study.

The initial sample consists of all the multi-segment firms present in the Compustat segment and industrial annual databases from fiscal year 2001 to 2006. Since I aim to study how top managers rely on internal financial reporting in their allocating decision, I only consider the initial source-year of each segment-year observation (i.e., unrestated data—the information that the headquarters receive). However, when investigating the change in future performance, I use the latest source year (i.e., restated data) to obtain more precise estimates of the segment's "true" productivity.[24] Firms classify segments by geographic location and by line of business. I am interested in the different lines of business, so I keep only business and operating segments and group them by their 4-digit SIC code.[25]

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[23] In the Scharfstein and Stein (2000) model, this would be translated by a lower marginal benefit of lobbying for any level of lobbying activities: $g'^{PostSOX}(r) < g'^{PreSOX}(r)$ *for all r.*

[24] I obtain similar results if I consider the latest source year when investigating changes in capital allocation decisions, and the initial source year when studying the change in future performance.

[25] After SFAS 131, segments can be reported across both geographic location and type of business, so one needs to group them by line of business in order to obtain business segments.

The construction of the database follows standard practices in the literature. I drop corporate segments (SID code equal to 99). I require segments to have information about their SIC code, assets, capital expenditure, sales, and operating profit. I also require assets, capital expenditure, and sales to be positive. The segment-level data (Compustat segment files) are cross-validated with the firm-level data (Compustat industrial annual files), and I keep only firms for which the sum of segment assets is within 25% of firm total assets in the annual files. When the sum of segment assets is not equal to firm assets (but meets the 25% threshold), the sum of segments assets is grossed up or down till it is equal to firm assets. Following Berger and Ofek (1995), I drop financial firms (SIC codes 6000-6999), firms with a financial segment,[26] and firms with total sales less than 20 million dollars. In addition, I also require firm market capitalization to be more than 75 million dollars since firms below this threshold are not required to comply with Section 404. Foreign firms (ADRs and dual-listed firms) are formally required to comply with most provisions of SOX at the same time as domestic firms (e.g., Section 302, CEO and CFO certification of financial statements and internal controls), except for Section 404 for which the formal compliance date is July 15, 2006 (i.e., the last fiscal year of the sample).[27] Since foreign conglomerates are affected by SOX, I include them in my sample. However, since

[26] The results are not affected if I include these firms.

[27] There is anecdotal evidence that large foreign firms listed in the United States. got ready to comply with Section 404 at the initial compliance date (see comment by Rob Lipton, KPMG Partner, "Sarbanes-Oxley goes Global", *Forbes*, 7/13/2006). Though some foreign firms might have waited till the last moment to comply with Section 404 or decided to delist from the United States because of the costs associated with SOX. However, smaller foreign firms, which are not included in my sample, were more likely to exit the United States (Marosi and Massoud, 2008).

they can delay their compliance with Section 404, I run several robustness tests to check the validity of my results. First, I find that their capital allocation policy is not significantly different from the one of domestic firms before and after the implementation of Section 404. Second, I re-run all the regressions while changing the definition of the dummy *Post-SOX* (for foreign firms: equals 1 if fiscal year ends after July 15, 2006) and find similar results. Finally, when excluding the foreign firms, I find similar results, although significance levels decrease due to a smaller sample size.

The investment variable is defined as the ratio of end-of-year capital expenditure to beginning-of-the-year assets (CAPX/AT). I measure performance by the ratio of operating profit to assets (ROA). These two variables are constructed at both the segment and firm level.[28] I also control for industry growth opportunities, which is defined as the median of the market-to-book assets ratio for single-segment firms within the same industry ($Q^{industry}$). Industry is defined by the narrowest 4-digit SIC, 3-digit SIC, or 2-digit SIC code for which there are at least five single-segment firms. To mitigate the influence of outliers, the variables CAPX/AT, ROA (both variables at the segment- and firm-level) and $Q^{industry}$ are winsorized at 1% in each tail. The final sample consists of 6,908 segment-year observations and 2,541 firm-year observations. On average, firm total assets represents 7.3 billion dollars and segment assets 2.7 billion dollars. Firms with

[28] The firm-level variables are defined as the sum of the segment-level variables (e.g., firm capital expenditure is equal to the sum of segment capital expenditure) except for the tests of changes in

more business segments tend be larger; the correlation between the number of segments and firm total assets is 28.6%. Summary statistics of the main variables are presented in Table 1.1. Most conglomerate firms have two business segments and the average Tobin's Q of the industry is 1.5. Summary statistics are similar to ones in recent studies (see, e.g., Xuan, 2009; Ozbas and Scharfstein, 2010).

Table 1.1. Summary Statistics

Table 1.1 provides summary statistics. The sample consists of multi-segment firms with market capitalization greater than 75 million dollars for fiscal year 2001-2006. ROA^{Seg} equals segment operating profit divided by segment assets at fiscal year end. ROA^{Firm} represents the sum of operating profit across firm segments divided by firm assets at fiscal year end. $CAPX^{Firm}/AT^{Firm}$ represents the sum of capital expenditure across firm segments divided by firm assets at the beginning of the fiscal year. $Q^{Ind\text{-}Seg}$ is the median of the market-to-book assets ratio for single-segment firms within the same industry as the segment. Industry is defined by the narrowest 4-digit, 3-digit, or 2-digit SIC code for which there are at least five single-segment firms. $Q^{Ind\text{-}Firm}$ is the assets-weighted average $Q^{Ind\text{-}Seg}$ of the firm. The variables *CAPX/AT*, *ROA,* and Q^{Ind} (both at the segment and firm level) are winsorized at 1% in each tail.

Stats	Mean	Median	SD	Min	Max	N
Segment level:						
$CAPX^{Seg}(t) / AT^{Seg}(t-1)$	6.51%	3.77%	9.07%	0.17%	63.72%	6,908
$ROA^{Seg}(t-1)$	8.53%	8.63%	14.70%	-80.29%	44.15%	6,908
$Q^{Ind\text{-}Seg}(t-1)$	1.51	1.35	0.51	0.85	5.39	6,908
Firm level:						
$CAPX^{Firm}(t) / AT^{Firm}(t-1)$	6.24%	4.28%	7.03%	0.27%	58.56%	2,541
$ROA^{Firm}(t-1)$	9.10%	9.09%	8.19%	-69.02%	35.81%	2,541
$Q^{Ind\text{-}Firm}(t-1)$	1.51	1.39	0.44	0.88	3.54	2,541
# Business Segments	2.71	2	0.99	2	7	2,541

future performance (Table 1.8, Panel A), for which I use the consolidated data in order to control for changes in auditing costs.

Finally, I also use restatement data and collect this information from Andy Leone's webpage. It contains information about which firms restated their financial statements (from the GAO database), and I collect this information for the period 1997-2003.

1.5 The Impact of SOX on Internal Capital Allocation Decisions

In this Section, I explore to which extent conglomerate firms rely on segment past performance in their allocation decision and how capital allocation decisions change after SOX as well as conglomerate's productivity and market value relative to stand-alone firms. Note that first I use the implementation of Section 404 to identify the pre- and post-SOX period; however, other provisions of SOX implemented prior to Section 404 impact firm's internal controls and thus potentially the allocation decision. I will consider alternative implementation dates in Section 1.6.

1.5.1 Univariate Analysis

According to Hypothesis 1.1, I expect the capital allocation process to be less rigid after SOX. This translates into a lower initial spending limit and more responsiveness of the allocation decision to information as reported by business segments (Harris and Raviv, 1996). Therefore, I expect more dispersion in investment across segments within the firm as well as greater correlation between investment and past performance.

In Panel A of Table 1.2, I report median statistics of variables measuring dispersion of investment across segments within the firm before and after SOX.[29] I observe an increase in the variance of investment across segments within the firm, in the range of investment and in the concentration of investment. For the variance and range statistics, I first use the ratio of segment investment to segment assets ($\sigma^2(CAPX^{Seg}/AT^{Seg})$ and $Range(CAPX^{Seg}/AT^{Seg})$). Second, in order to control for changes in the level of firm investment, I study the variance and range of investment across segments within the firm divided by firm investment ($\sigma^2(CAPX^{Seg})/CAPX^{Firm}$ and $Range(CAPX^{Seg})/CAPX^{Firm}$). Concentration of investment is measured by a Herfindahl-based index (i.e., sum of the squared-ratios of segment-to-firm capital expenditure, $HHI(CAPX^{Seg}/CAPX^{Firm})$).

In Panel B, I study how the correlation of firm-adjusted investment and firm-adjusted ROA changes after SOX. I analyze the variation across all multi-segment firms. Before SOX, this correlation is negative (-1.36%), whereas, it is positive after SOX (5.90%)—the change of correlation is significant.[30] Therefore, after SOX, conglomerates tend to allocate more capital in their highest-performing segments, while before SOX they tend to subsidize their worst-performing segments.

[29] I use median statistics to control for potential outliers. I obtain similar results if I study the mean statistics.

[30] I rely on the method of Cohen and Cohen (1983) to compute the test of the difference between two independent correlation coefficients. The method is based on Fisher z' transformation and takes into account sample size.

These univariate results are consistent with the theory and Hypothesis 1.1. After SOX, there is less rigidity in the capital allocation process in the sense that there is greater dispersion of investment across segments and more reliance on past performance in the decision of allocating resources across the business segments.

Table 1.2. Univariate Analysis - A Snapshot of Capital Budget Before and After SOX

Table 1.2 provides median and correlation statistics before and after implementation of SOX 404 (i.e., fiscal year ends before or after November 15 2004). The sample consists of multi-segment firms with market capitalization greater than 75 million dollars for fiscal year 2001-2006. The variables are defined at the firm level in Panel A, and at the segment level in Panel B. HHI is the sum of the squared ratios of segment capital expenditure to firm capital expenditure. ROA equals operating profit divided by assets at fiscal year end. In Panel B, z-stat is computed according to Cohen and Cohen (1983). Asterisks indicate statistical significance at the 1% (***), 5% (**), or 10% (*) level.

Panel A: Variation of Investment across Divisions

Median Statistics

Variables (at the firm level)	Pre-SOX 404	Post-SOX 404	Difference	Wilcoxon z-stat
$\sigma^2(CAPX^{Seg}/AT^{Seg})$	0.06%	0.08%	0.02%***	2.950
$\sigma^2(CAPX^{Seg}) / CAPX^{Firm}$	10.24	13.94	3.70***	3.393
$Range(CAPX^{Seg}/AT^{Seg})$	3.23%	3.80%	0.57%***	3.064
$Range(CAPX^{Seg}) / CAPX^{Firm}$	57.61%	61.64%	4.03%*	1.710
$HHI(CAPX^{Seg}/CAPX^{Firm})$	58.20%	62.90%	4.70%**	2.440

Panel B: Correlation of Firm-adjusted Investment and Performance

Correlation $[CAPX^{Seg}(t)/AT^{Seg}(t-1) - CAPX^{Firm}(t)/AT^{Firm}(t-1)\ ,\ ROA^{Seg}(t-1) - ROA^{Firm}(t-1)]$

	Pre-SOX 404	Post-SOX 404	Difference	z-stat
All Multi-Segment Firms	-1.36%	5.90%	7.26%***	3.018
Firms with # Bus. Seg. = 2	6.26%	2.66%	-3.60%	0.959
Firms with # Bus. Seg. ≥ 3	-4.81%	8.24%	13.05%***	4.164

1.5.2 Responsiveness of Investment to Performance Before and After SOX

1.5.2.1 Baseline Specification

My main objective in this section is to investigate how firm reliance on past performance in the allocation decision changes after SOX. My baseline specification is the following panel regression, with segment and year fixed-effects:

$$\frac{CAPX_t^{Seg(i,j)}}{AT_{t-1}^{Seg(i,j)}} - \frac{CAPX_t^{Firm(j)}}{AT_{t-1}^{Firm(j)}} = \beta_0^{Seg(i,j)} + \beta_1 \times Pre\text{-}SOX \times \left[ROA_{t-1}^{Seg(i,j)} - ROA_{t-1}^{Firm(j)}\right]$$

$$+ \beta_2 \times Post\text{-}SOX \times [ROA_{t-1}^{Seg(i,j)} - ROA_{t-1}^{Firm(j)}] + \delta_t + \varepsilon_{ijt} \quad (1)$$

where $\frac{CAPX_t^{Seg(i,j)}}{AT_{t-1}^{Seg(i,j)}} - \frac{CAPX_t^{Firm(j)}}{AT_{t-1}^{Firm(j)}}$ is a measure for segment capital allocation (the firm-adjusted investment ratio) of segment *i* in firm *j* at time *t*, $\beta_0^{Seg(i,j)}$ is the segment-specific intercept (i.e. segment fixed-effects) to capture unobserved time-invariant heterogeneity across segments in the level of investment, *Post-SOX* (*Pre-SOX*) is a dummy variable that takes the value one if fiscal year ends after (before) November 15, 2004, $ROA_{t-1}^{Seg(i,j)}$ is the ratio of segment operating profit to segment assets of segment *i* in firm *j* at time *t-1*, $ROA_{t-1}^{Firm(j)}$ is the ratio of firm

operating profit to firm assets of firm *j* at time *t-1*, and δ_t captures year fixed-effects.[31, 32]

β_1 and β_2 represent the responsiveness of investment to performance, before and after SOX respectively. A positive coefficient means that firms tend to allocate more capital in their best-performing business segments while a negative coefficient indicates that firms tend to subsidize their worst-performing segments. The magnitude of the coefficient is of great matter in this study since it represents to which extent top-executives rely on past performance (i.e. internal financial reports) in their capital allocation decision as well as to which extent there is relative performance evaluation across the segments. Hypothesis 1.1 predicts that the responsiveness of investment to performance should increase after SOX, thus I investigate whether β_2 is greater than β_1 via a test of inequality of coefficients.

Note that this study departs from previous empirical studies: previous studies focus on the relation between the allocation decision and the Q of the industry, a measure of industry growth opportunities, while I focus on how the performance as reported by business segments is related to the capital allocation decision and will control for the Q of the industry. My focus on explaining allocation decision by past performance (and not Q of the industry) is motivated by several

[31] Since I include year fixed-effects, I do not add the dummy *Post-SOX* in the regression. Results are almost identical if I include the dummy *Post-SOX*.

arguments. First, it captures better the actual business practices. In a recent survey of more than 1,000 US CEOs, Graham, Harvey, and Puri (2010) document that 78.6% of their respondents use the NPV rank in their capital allocation decision. This ranking measure is consistent with the fact that there is relative performance evaluation across projects and divisions. They also find that a large proportion of respondents use previous return (51.2%) and manager reputation (71.3%) in their allocation decision. To the extent that reputation is built based on past performance, these results indicate that past performance is an important factor in the capital allocation decision of US managers. Thus Graham, Harvey, and Puri (2010) show that a large proportion of CEOs use past return and reputation, which to some extent is built on past performance, as well as relative performance across divisions in their capital allocation decisions. In addition, my empirical specification is also better suited to study the effects of SOX (i.e., it captures the change in the quality of internal financial reporting) as well as to test the theory (e.g., Harris and Raviv, 1996).[33] Finally, it circumvents the problem of measurement errors in Q that has been reported in past studies (see, e.g., Whited, 2001).[34]

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[32] I use standard errors clustered at the segment level since my sample represents a large panel of segments with a short time series and since the results from my regressions suggest that unobserved segment fixed-effects are important. See Petersen (2009) for an analysis of this issue.

[33] In addition, as exposed in Wulf (2002), which also focuses on the relation between past profitability and segment investment, industry Q does not capture *segment-specific* investment opportunities and since profits tend to be persistent, current profits are in general a reasonable indicator of future profits.

[34] Nevertheless, my conclusions about the efficiency of allocation decisions would not be affected if I based my analysis on the sensitivity of investment to industry Q (instead of responsiveness of investment to past performance).

In Panel A of Table 1.3, I report the estimates of the panel regression. Across all conglomerate firms, I find that the sensitivity of investment to performance increases after SOX—the sensitivity is 3.0% before SOX, while it is 8.5% after SOX. Before SOX there is no significant sensitivity, which means that, on average, firms do not invest more in their best-performing segments. On the other hand, after SOX, the responsiveness of investment to performance is significant at a 1% confidence level. The difference of responsiveness before and after SOX is significant at a 5% confidence level, which is consistent with Hypothesis 1.1. These results confirm those from the univariate analysis: after SOX, firms rely more on past performance in their internal capital allocation decisions. In column (2) of Panel A of Table 1.3, I control for industry investment opportunities and find consistent results. I measure industry investment opportunities by the difference of the segment's industry Q and segment-asset-weighted average industry Q at the firm level (i.e., $Q_{t-1}^{Ind-Seg(i,j)} - Q_{t-1}^{Ind-Firm(j)}$). The increase of responsiveness of investment to performance is even greater once including Q of the industry in the regression.

In addition, I find that the sensitivity of investment to industry Q increases after SOX. After SOX, firms tend to invest more in segments operating in industries with greater investment opportunities. Using similar logic than previous papers, this would indicate that internal allocations are more efficient after SOX.

Table 1.3. Responsiveness of Investment to Performance Before and After SOX

Table 1.3 shows results of OLS fixed-effects regressions for a sample of multi-segment firms with market capitalization greater than 75 million dollars. The sample period is fiscal year 2001-2006 *Post-SOX* is a dummy variable that takes the value of one if the fiscal-year ends after November 15, 2004. *ROA* equals operating profit divided by assets at fiscal year end. $Q^{Ind\text{-}Seg}$ is the median of the market-to-book assets ratio for single-segment firms within the same industry as the segment. Industry is defined by the narrowest 4-digit, 3-digit, or 2-digit SIC code for which there are at least five single-segment firms. $Q^{Ind\text{-}Firm}$ is the assets-weighted average $Q^{Ind\text{-}Seg}$ of the firm. $ROA^{Other\text{-}Seg}$ is the average *ROA* of the other segments of the firm. $Q^{Ind\text{-}Other\text{-}Seg}$ is the average Q^{Ind} of the other segments of the firm. Robust standard errors clustered at the segment level are reported in parentheses. P-values of the tests of inequality of the coefficients are reported in braces. Asterisks indicate statistical significance at the 1% (***), 5% (**), or 10% (*) level.

Panel A: Baseline Specification

Dependent Variable: $CAPX^{Seg}(t) / AT^{Seg}(t-1) - CAPX^{Firm}(t) / AT^{Firm}(t-1)$

	[2001-2006] Period	
	(1)	(2)
Pre-SOX * $[ROA^{Seg}(t-1) - ROA^{Firm}(t-1)]$	0.030	0.027
	(0.030)	(0.030)
Post-SOX * $[ROA^{Seg}(t-1) - ROA^{Firm}(t-1)]$	0.085***	0.085***
	(0.026)	(0.026)
Pre-SOX * $[Q^{Ind\text{-}Seg}(t-1) - Q^{Ind\text{-}Firm}(t-1)]$		0.003
		(0.005)
Post-SOX * $[Q^{Ind\text{-}Seg}(t-1) - Q^{Ind\text{-}Firm}(t-1)]$		0.012**
		(0.005)
Year F.E.	Y	Y
Segment F.E.	Y	Y
# Obs.	6,908	6,908
Within R^2	0.011	0.012
R^2	0.657	0.658
Tests of inequality of coefficients:		
*δ = Post – Pre-SOX * $[ROA^{Seg} - ROA^{Firm}]$*	*0.055**	*0.058**
H_0: $\delta = 0$, H_A: $\delta > 0$ {p-value}	*{0.019}*	*{0.014}*

Table 1.3. Continued

Panel B: Alternative Specification Dependent Variable: $CAPX^{Seg}(t) / AT^{Seg}(t-1) - CAPX^{Firm}(t) / AT^{Firm}(t-1)$		
	(1)	(2)
Pre-SOX * $ROA^{Seg}(t-1)$	0.019	0.017
	(0.025)	(0.025)
Post-SOX * $ROA^{Seg}(t-1)$	0.052**	0.054**
	(0.022)	(0.022)
Pre-SOX * $ROA^{Other-Seg}(t-1)$	-0.009	-0.011
	(0.011)	(0.012)
Post-SOX * $ROA^{Other-Seg}(t-1)$	-0.046***	-0.043***
	(0.012)	(0.012)
Pre-SOX * $Q^{Ind-Seg}(t-1)$		0.002
		(0.003)
Post-SOX * $Q^{Ind-Seg}(t-1)$		0.003
		(0.004)
Pre-SOX * $Q^{Ind-Other-Seg}(t-1)$		0.002
		(0.003)
Post-SOX * $Q^{Ind-Other-Seg}(t-1)$		-0.005
		(0.004)
Year F.E.	Y	Y
Segment F.E.	Y	Y
# Obs.	6,908	6,908
Within R^2	0.008	0.010
R^2	0.608	0.608
Tests of inequality of coefficients:		
*δ = Post – Pre-SOX * ROA^{Seg}*	*0.033**	*0.037***
H_0: δ = 0, H_A: δ > 0 {p-value}	*{0.062}*	*{0.045}*
*δ = Post – Pre-SOX * $ROA^{Other-Seg}$*	*-0.037****	*-0.033***
H_0: δ = 0, H_A: δ > 0 {p-value}	*{0.004}*	*{0.010}*

1.5.2.2 Alternative Specification

I change my baseline specification by not adjusting for firm performance and by including past performance of other segments in the firm (results are reported in Panel B). In other words, I study the following panel regression:

$$\frac{CAPX_t^{Seg(i,j)}}{AT_{t-1}^{Seg(i,j)}} - \frac{CAPX_t^{Firm(j)}}{AT_{t-1}^{Firm(j)}} = \beta_0^{Seg(i,j)} + \beta_1 \times Pre\text{-}SOX \times ROA_{t-1}^{Seg(i,j)}$$

$$+ \beta_2 \times Post\text{-}SOX \times ROA_{t-1}^{Seg(i,j)} + \beta_3 \times Pre\text{-}SOX \times ROA_{t-1}^{OtherSeg(\neq i,j)}$$

$$+ \beta_4 \times Post\text{-}SOX \times ROA_{t-1}^{OtherSeg(\neq i,j)} + \delta_t + \varepsilon_{ijt} \quad (2)$$

where $ROA_{t-1}^{OtherSeg(\neq i,j)}$ is the average ratio of segment operating profit to segment assets; the average is computed for segments other than segment *i* of firm *j*.

The conclusions from this analysis are consistent with the previous findings. I find that the sensitivity of segment investment to segment performance increases significantly after SOX. The sensitivity is 1.7% before SOX, while it is 5.4% after SOX. At the same time, the sensitivity of segment investment to performance of other segments in the firm decreases significantly (becomes more negative) after SOX: from -1.1% to -4.3%. In other words, firms rely more on segment past performance in their capital allocation decision. In addition, after SOX there is more relative performance evaluation across segments, and thus on average firms do not subsidize their worst-performing segments after SOX.

1.5.3 Change in Responsiveness for Firms that Are More Prone Versus Less Prone to Asymmetric Information Problems Across Hierarchies

Although SOX affects all publicly traded conglomerates, it does not affect all conglomerates the same way. Conglomerates that are more prone to asymmetric information problems will react more to the implementation of SOX. Due to limitations in acquiring specific knowledge (Jensen and Meckling, 1992), the within-firm information problem should be stronger for firms with more divisions. These firms tend be more complex and, furthermore, require more information gathering than firms with fewer divisions. It is more costly for firms with more divisions to audit and verify numbers from divisions and to monitor them (Stein, 1997). I, therefore, expect firms with more divisions to be more affected by SOX. The median number of segments is 2, so I compare firms that have two segments with firms that have three or more segments.[35]

I first investigate how the univariate results vary across the two groups of firms. In Table 1.2, I study how the changes in correlations between investment and ROA vary across multi-segment firms. I observe that there is no significant change for firms with two segments (the correlation decreases, 6.26% before SOX, and 2.66% after SOX). At the same time the correlation significantly increases for firms with three segments or more (the correlation is negative before SOX, -4.81%, and positive after SOX, 8.24%).

[35] Changes tend to be even more pronounced for firms with a higher number of segments (four segments or more). However, the level of significance is lower due to the decrease in sample size.

Table 1.4. Responsiveness of Investment to Performance by Number of Segments

Table 1.4 shows results of OLS fixed-effects regressions for a sample of multi-segment firms with market capitalization greater than 75 million dollars for 2001-2006. *Post-SOX* is a dummy variable that takes the value of one if the fiscal year ends after November 15, 2004. *ROA* equals operating profit divided by assets at fiscal year end. $Q^{Ind\text{-}Seg}$ is the median of the market-to-book assets ratio for single-segment firms within the same industry as the segment. Industry is defined by the narrowest 4-digit, 3-digit, or 2-digit SIC code for which there are at least five single-segment firms. $Q^{Ind\text{-}Firm}$ is the assets-weighted average $Q^{Ind\text{-}Seg}$ of the firm. P-values of the tests of inequality of the coefficients are reported in braces. Asterisks indicate statistical significance at the 1% (***), 5% (**), or 10% (*) level.

Dependent Variable: $CAPX^{Seg}(t) / AT^{Seg}(t\text{-}1) - CAPX^{Firm}(t) / AT^{Firm}(t\text{-}1)$

	Firms with # Bus. Seg. = 2		Firms with # Bus. Seg. ≥ 3	
	(1)	(2)	(3)	(4)
Pre-SOX * $[ROA^{Seg}(t\text{-}1) - ROA^{Firm}(t\text{-}1)]$	0.062	0.061	0.031	0.028
	(0.046)	(0.047)	(0.040)	(0.039)
Post-SOX * $[ROA^{Seg}(t\text{-}1) - ROA^{Firm}(t\text{-}1)]$	0.078*	0.079*	0.123***	0.122***
	(0.044)	(0.045)	(0.036)	(0.036)
Pre-SOX * $[Q^{Ind\text{-}Seg}(t\text{-}1) - Q^{Ind\text{-}Firm}(t\text{-}1)]$		0.002		0.002
		(0.007)		(0.006)
Post-SOX * $[Q^{Ind\text{-}Seg}(t\text{-}1) - Q^{Ind\text{-}Firm}(t\text{-}1)]$		0.012		0.013**
		(0.011)		(0.006)
Year F.E.	Y	Y	Y	Y
Segment F.E.	Y	Y	Y	Y
# Obs.	2,834	2,834	4,074	4,074
Within R^2	0.013	0.014	0.021	0.023
R^2	0.613	0.614	0.668	0.669
Tests of inequality of coefficients:				
*δ = Post – Pre-SOX * $[ROA^{Seg} - ROA^{Firm}]$*	*0.016*	*0.018*	*0.092****	*0.094****
H_0: $\delta = 0$, H_A: $\delta > 0$ {p-value}	*{0.313}*	*{0.293}*	*{0.010}*	*{0.007}*
$\Delta = \delta^{\#\text{ Bus. Seg} \geq 3} - \delta^{\#\text{ Bus. Seg} = 2}$			*0.076**	*0.076**
H_0: $\Delta = 0$, H_A: $\Delta > 0$ {p-value}			*{0.072}*	*{0.065}*

Second, using the baseline specification, I compare the change of responsiveness of investment to performance between the two groups. The results are reported

in Table 1.4. The sensitivity increases slightly after SOX for firms with two segments (6.1% before SOX, and 7.9% after SOX), while it increases significantly for firms with three segments or more (2.8% before, 12.2% after). In addition, the increase for firms with three segments or more is significantly larger than for firms with two segments (see second test of inequality of coefficients at the bottom of Table 1.4).

These results show that changes in internal allocation decisions are more pronounced for that firms that are most prone to information asymmetry problems across corporate hierarchies.

1.5.4 Responsiveness of Investment to Performance for Firms that Restated Their Financial Reports

Restatement of financial reports is a signal of weaker internal controls and less reliable internal financial reports. I investigate the change of responsiveness for firms that restated their financial statements in the years 1997-2003. I expect that these firms do not rely on past performance in their allocation decision in the pre-SOX period and to some extent would be more affected by SOX. The results are reported in Table 1.5.

I find that there is a large increase in the sensitivity of capital allocation to reported performance for restating firms. Before SOX, the sensitivity is negative (-5.6%), while the sensitivity is positive and significant after SOX (10.1%). In

addition, even though the sample size is small, the increase in sensitivity is significant at a 5% confidence level.

Table 1.5. Responsiveness of Investment to Performance for Restating Firms

Table 1.5 shows results of OLS fixed-effects regressions for a sample of multi-segment firms with market capitalization greater than 75 million dollars for 2001-2006. *Restatement* represents a sample of firms that restated their financial statements during the period 1997-2003. *Post-SOX* is a dummy variable that takes the value of one if the fiscal year ends after November 15, 2004. *ROA* equals operating profit divided by assets at fiscal year end. The pair-matching is based on number of segments in the firm (*required*), whether the ratio of segment-to-firm assets is greater or smaller than one divided by number of segments (*required*), $Q^{industry}$ (*closest – 1st criteria*), and segment assets (*closest – 2nd criteria*). Robust standard errors clustered at the segment level are reported in parentheses. P-values of the tests of inequality of the coefficients are reported in braces. Asterisks indicate statistical significance at the 1% (***), 5% (**), or 10% (*) level.

Dependent Variable: $CAPX^{Seg}(t) / AT^{Seg}(t-1) - CAPX^{Firm}(t) / AT^{Firm}(t-1)$				
	Restatement		Sample Selection Check: Matched-Pair Sample	
	(1)	(2)	(3)	(4)
Pre-SOX * $[ROA^{Seg}(t-1) - ROA^{Firm}(t-1)]$	-0.039	-0.056	0.038	0.037
	(0.096)	(0.096)	(0.054)	(0.054)
Post-SOX * $[ROA^{Seg}(t-1) - ROA^{Firm}(t-1)]$	0.105*	0.101*	0.105**	0.105**
	(0.060)	(0.061)	(0.053)	(0.052)
Pre-SOX * $[Q^{Ind\text{-}Seg}(t-1) - Q^{Ind\text{-}Firm}(t-1)]$		-0.004		-0.017
		(0.011)		(0.013)
Post-SOX * $[Q^{Ind\text{-}Seg}(t-1) - Q^{Ind\text{-}Firm}(t-1)]$		0.028*		-0.004
		(0.015)		(0.011)
Year F.E.	Y	Y	Y	Y
Segment F.E.	Y	Y	Y	Y
# Obs.	878	878	878	878
Within R^2	0.039	0.048	0.040	0.043
R^2	0.629	0.632	0.670	0.671
Tests of inequality of coefficients:				
*δ = Post – Pre-SOX * $[ROA^{Seg} - ROA^{Firm}]$*	*0.144***	*0.157***	*0.067**	*0.068**
H_0: $\delta = 0$, H_A: $\delta > 0$ {p-value}	*{0.042}*	*{0.028}*	*{0.090}*	*{0.082}*

I investigate whether the level of responsiveness before and after SOX can be associated to firms' and segments' characteristics by performing matched-pair sample analysis (see results in columns (3) and (4)). The pair-matching is based on number of segments in the firm (*required*), whether the ratio of segment-to-firm assets is greater than or smaller than one divided by the number of segments (*required*), $Q^{industry}$ (*closest – 1st criteria*), and segment assets (*closest – 2nd criteria*). I find that the results of pair-matched sample are very similar to the results of the full sample, which suggest that the results are not driven by firms' and segments' characteristics.

It is interesting to note that while the levels of responsiveness are quasi-identical after SOX across both groups, the sensitivity is considerably smaller and even negative for restating firms before SOX. These results suggest that information problems were more important in restating firms and, as a result, firms rely even less on past performance in the pre-SOX period. The implementation of SOX levels the playing field among firms by improving reliability of information even more for restating firms. As a consequence, the increase in sensitivity is larger for restating firms.

1.5.5 Responsiveness of Investment to Performance for Firms with Weak Internal Controls

Since the implementation of Section 404, I can observe the report regarding the effectiveness of internal controls written by the firm's auditor. I collect this

information and identify firms the reports for which indicate material weakness in internal controls in the post-SOX period (2004-2006) and I investigate the responsiveness before and after SOX.[36] Auditor opinion is useful information since it provides a direct measure of the quality of internal controls and, thus, allows me to further investigate the importance of internal controls in the capital allocation decision. Results are reported in Table 1.6.

I find that the responsiveness is negative and non-significant both before and after the implementation of SOX for firms with material weakness in the post-SOX period (-4.9% before SOX and -2.7% after SOX). Since internal controls are weak in the post-SOX period, I expect these firms to not rely on past performance in the capital allocation after SOX. Moreover, it is likely that these firms also have weak internal controls before SOX and, thus, they would also not rely on past performance in the pre-SOX period. Furthermore, the increase in sensitivity after SOX (less negative) is small and not significant (+2.2%). Since internal controls are (still) weak after the implementation of SOX, SOX did not resolve the internal control problems. Thus, these firms potentially are less affected by SOX.

The results are not driven by firms' and segments' characteristics: I find that the results of the pair-matched sample are very similar to results of the full sample, although significance drops due to a small sample size.

[36] I obtain this information from the Compustat database (data item *auopic*).

Table 1.6. Responsiveness of Investment to Performance for Firms with Weak Internal Controls

Table 1.6 shows results of OLS fixed-effects regressions for a sample of multi-segment firms with market capitalization greater than 75 million dollars for 2001-2006. *Material Weakness in Internal Controls (Post-SOX)* represents a sample of firms for which auditor reports material weakness in the company's internal controls during the post-SOX period (2004-2006). *Post-SOX* is a dummy variable that takes the value of one if the fiscal year ends after November 15, 2004. *ROA* equals operating profit divided by assets at fiscal year end. The pair-matching is based on number of segments in the firm (*required*), whether the ratio of segment-to-firm assets is greater or smaller than one divided by number of segments (*required*), $Q^{industry}$ (*closest – 1st criteria*) and segment assets (*closest – 2nd criteria*). Robust standard errors clustered at the segment level are reported in parentheses. P-values of the tests of inequality of the coefficients are reported in braces. Asterisks indicate statistical significance at the 1% (***), 5% (**), or 10% (*) level.

Dependent Variable: $CAPX^{Seg}(t) / AT^{Seg}(t-1) - CAPX^{Firm}(t) / AT^{Firm}(t-1)$				
	Material Weakness in Internal Controls (Post-SOX)		Sample Selection Check: Matched-Pair Sample	
	(1)	(2)	(3)	(4)
Pre-SOX * $[ROA^{Seg}(t-1) - ROA^{Firm}(t-1)]$	-0.052	-0.049	0.042	0.031
	(0.075)	(0.074)	(0.053)	(0.055)
Post-SOX * $[ROA^{Seg}(t-1) - ROA^{Firm}(t-1)]$	-0.023	-0.027	0.087*	0.081*
	(0.049)	(0.050)	(0.047)	(0.049)
Pre-SOX * $[Q^{Ind\text{-}Seg}(t-1) - Q^{Ind\text{-}Firm}(t-1)]$		0.005		0.010
		(0.024)		(0.012)
Post-SOX * $[Q^{Ind\text{-}Seg}(t-1) - Q^{Ind\text{-}Firm}(t-1)]$		-0.009		0.025**
		(0.019)		(0.010)
Year F.E.	Y	Y	Y	Y
Segment F.E.	Y	Y	Y	Y
# Obs.	776	776	776	776
Within R^2	0.013	0.014	0.021	0.028
R^2	0.562	0.562	0.678	0.680
Tests of inequality of coefficients:				
*δ = Post – Pre-SOX * $[ROA^{Seg} - ROA^{Firm}]$*	*0.029*	*0.022*	*0.045*	*0.050**
H_0: $\delta = 0$, H_A: $\delta > 0$ {p-value}	*{0.284}*	*{0.323}*	*{0.118}*	*{0.098}*

1.5.6. Earnings Management and Responsiveness of Investment to Performance

In this subsection, I investigate the responsiveness of investment to past performance when firms are more or less likely to manage the earnings. Research in accounting has developed measures of discretionary accruals to assess the potential for earnings management within the firm. Discretionary accruals are defined as the difference between total accruals and predicted total accruals. Total accruals represent earnings minus cash flows. Following Hribar and Collins (2002), I define total accruals as the difference between income before extraordinary items and cash flows from continuing operations divided by beginning-of-year total assets.[37, 38] I employ a version of the Modified Jones Model (see Jones, 1991; Dechow, Sloan and Sweeney, 1995) to compute the predicted accruals. Precisely, I run the following regression over the 1999-2003 period for Compustat firms:

$$Total\ Accruals_t = \alpha_0 + \alpha_1 \times \frac{1}{Assets_{t-1}} + \alpha_2 \times \frac{\Delta Sales_t}{Assets_{t-1}} + \alpha_3 \times \frac{PPE_t}{Assets_{t-1}} + \epsilon_t \quad (3)$$

where *PPE* represents the gross property plant and equipment of the firm.

I then use the estimated coefficients to compute the predicted accruals:

[37] Hribar and Collins (2002) show that this approach is more precise than the balance-sheet method.

[38] Following the literature I censor observations for which total accruals exceed +100% or -100%.

$$Predicted\ Total\ Accruals_t = \widehat{\alpha_0} + \widehat{\alpha_1} \times \frac{1}{Assets_{t-1}} + \widehat{\alpha_2} \times \frac{\Delta Sales_t - \Delta Receivables_t}{Assets_{t-1}} +$$

$$\widehat{\alpha_3} \times \frac{PPE_t}{Assets_{t-1}} \qquad (4)$$

Discretionary accruals are the difference between total accruals and predicted accruals. I then compute the average of the absolute value of discretionary accruals over the 1999-2003 period. I classify firms with discretionary accruals above (below) the median as *High (Low) Discretionary Accruals* firms and study their responsiveness before and after SOX. Results are reported in Table 1.7.

SOX has improved earnings quality (see Iliev, 2010), thus, I expect firms that are more likely to manage their earnings to be more affected. Indeed, I find that firms with high discretionary accruals before SOX tend to rely less on past performance, while this difference of sensitivity is smaller in the post-SOX period. However, contrary to the results related to number of business segments, I find that the difference in the change of sensitivity is not significant. Although discretionary accruals can capture manipulation of firms' reported earnings at the segment level (i.e., earnings management from the bottom-up), it can also capture manipulation at the headquarter level (i.e. earnings management from the top-down—e.g., the CEO pushing the earnings in order to not miss the earnings target). Both types of earnings management will affect earnings informativeness but would capture different aspects of information problems within the organization. Therefore, to the extent that the results related to the

complexity of the organization (i.e., number of segments) are more conclusive than the ones related to earnings management indicate that information frictions from the bottom-up along the corporate hierarchy are at the root of the problem of inefficiencies in the capital allocation decision.

Table 1.7. Earnings Management and the Responsiveness of Invest. to Performance

Table 1.7 shows results of OLS fixed-effects regressions. Low (High) Discretionary Accruals are firms with pre-SOX average discretionary accruals below (above) the median. The average value is calculated over the fiscal years 1999-2003. Discretionary accruals are the difference between total accruals and accruals predicted by the Modified Jones Model. *Post-SOX* is a dummy variable that takes the value of one if the fiscal year ends after November 15, 2004. *ROA* equals operating profit divided by assets at fiscal year end. Robust standard errors clustered at the segment level are reported in parentheses. P-values of the tests of inequality of the coefficients are reported in braces. Asterisks indicate statistical significance at the 1% (***), 5% (**), or 10% (*) level.

Dependent Variable: $CAPX^{Seg}(t) / AT^{Seg}(t-1) - CAPX^{Firm}(t) / AT^{Firm}(t-1)$				
	Low Dis. Accruals		High Dis. Accruals	
	(1)	(2)	(3)	(4)
Pre-SOX * $[ROA^{Seg}(t-1) - ROA^{Firm}(t-1)]$	0.053	0.050	0.012	0.009
	(0.036)	(0.036)	(0.045)	(0.045)
Post-SOX * $[ROA^{Seg}(t-1) - ROA^{Firm}(t-1)]$	0.094**	0.094**	0.082**	0.083**
	(0.041)	(0.040)	(0.035)	(0.035)
Pre-SOX * $[Q^{Ind\text{-}Seg}(t-1) - Q^{Ind\text{-}Firm}(t-1)]$		0.003		0.003
		(0.005)		(0.008)
Post-SOX * $[Q^{Ind\text{-}Seg}(t-1) - Q^{Ind\text{-}Firm}(t-1)]$		0.013*		0.011
		(0.008)		(0.008)
Year F.E.	Y	Y	Y	Y
Segment F.E.	Y	Y	Y	Y
# Obs.	3225	3225	3254	3254
Within R^2	0.013	0.015	0.014	0.015
R^2	0.642	0.643	0.568	0.568
Tests of inequality of coefficients:				
$\delta = Post - Pre\text{-}SOX * [ROA^{Seg} - ROA^{Firm}]$	*0.041*	*0.044**	*0.070***	*0.074***
$H_0: \delta = 0, H_A: \delta > 0$ {p-value}	*{0.114}*	*{0.098}*	*{0.041}*	*{0.033}*
$\Delta = \delta^{High\ Discretionary\ Accruals} - \delta^{Low\ Discretionary\ Accruals}$			*0.029*	*0.030*
$H_0: \delta = 0, H_A: \delta > 0$ {p-value}			*{0.293}*	*{0.286}*

1.5.7 Future Performance

In order to test Hypothesis 1.2, I employ a difference-in-differences methodology and compare the change in operating performance after SOX for conglomerate and stand-alone firms. In panels A and B of Table 1.8, I report fixed-effect estimates of the regression of future ROA on a Post-SOX dummy variable. The coefficient for the Post-SOX dummy variable represents the average change in future operating performance after SOX. In Panel A, I show the performance at the firm level and in Panel B at the segment level.[39]

In general, future profitability increases after SOX. The coefficients are positive for each sub-group but the coefficients are significantly greater for firms that are more affected by SOX. In addition, I observe a monotone increase of future performance by number of segments: (i) at the firm-level (Panel A), firms with one segment: +0.8%, two segments: +1.4%, and three segments and more: +1.8%) (ii) at the segment-level (Panel B), firms with one segment: +0.9%, two segments: +1.3%, and three segments and more: +2.5%.

I repeat the analysis by executing a pair-matching analysis to limit potential sample selection bias (results shown in Panel C). The matching is based on the 3-digit SIC code of the segment industry (*required*) and segment assets (*closest*). The results are consistent with the ones in Panel A and Panel B. I find that the

[39] Since firms have discretion with regard to how to allocate auditing costs (can be included at the segment level or only at the firm level), it is important to study the change of performance both at the segment level and at the firm level to account for changes in auditing costs due to the implementation of Section 404.

increase in productivity is more pronounced for more affected firms and segments. In general, multi-segment firms exhibit higher productivity than single-segment firms, which is consistent with Schoar (2002), and this productivity advantage increases after SOX.

Table 1.8. Future Performance

Panel A and Panel B show results of OLS fixed-effects regressions for a sample of single and multi-segment firms with market capitalization greater than 75 million dollars for 2001-2006. *Post-SOX* is a dummy variable that takes the value of one if the fiscal year ends after November 15, 2004. *ROA* equals operating profit divided by assets at fiscal year end. Robust standard errors clustered at the firm-level (Panel A) and at the segment-level (Panel B) are reported in parentheses. Panel C shows results of the pair-matching analysis. The matching is based on the 3-digit SIC code of the segment industry (*required*) and segment assets (*closest*). P-values of the tests of inequality of the coefficients are reported in braces. Asterisks indicate statistical significance at the 1% (***), 5% (**), or 10% (*) level.

	Panel A Fixed-Effect Regression – Firm-level Dependent Variable: $ROA^{Firm}(t+1)$			
	All Single-Segment Firms	All Multi-Segment Firms	Firms with # Bus. Segment	
			= 2	≥ 3
	(1)	(2)	(3)	(1)
Post-SOX	0.008***	0.016***	0.014***	0.018***
	(0.003)	(0.004)	(0.004)	(0.005)
Constant	0.056***	0.087***	0.086***	0.089***
	(0.001)	(0.001)	(0.002)	(0.002)
Firm F.E.	Y	Y	Y	Y
# Obs.	7877	2186	1286	900
Within R^2	0.003	0.042	0.024	0.069
R^2	0.813	0.770	0.783	0.822
Tests of inequality of coefficients:				
$\delta = Post\text{-}SOX^{MoreAffected} - PostSOX^{LessAffected}$		*0.008***		*0.004*
$H_0: \delta = 0, H_A: \delta > 0$ {p-value}		*{0.042}*		*{0.167}*

Table 1.8. Continued

Panel B

Fixed-Effect Regression – Segment-level

Dependent Variable: $ROA^{Segment}(t+1)$

	All Single-Segment Firms (1)	All Multi-Segment Firms (2)	Firms with # Bus. Seg. = 2 (3)	Firms with # Bus. Seg. ≥ 3 (4)	Segments with AT^{Seg}/AT^{Firm} >1/# Bus.Seg. (Larger Seg.) (5)	Segments with AT^{Seg}/AT^{Firm} <1/#Bus.Seg. (Smaller Seg.) (6)
Post-SOX	0.009***	0.020***	0.013**	0.025***	0.016***	0.025***
	(0.003)	(0.004)	(0.006)	(0.005)	(0.004)	(0.007)
Constant	0.057***	0.091***	0.092***	0.091***	0.097***	0.086***
	(0.001)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)
Segment F.E.	Y	Y	Y	Y	Y	Y
# Obs.	7877	5598	2520	3078	2600	2998
Within R^2	0.003	0.014	0.005	0.024	0.018	0.016
R^2	0.806	0.790	0.800	0.805	0.780	0.804
Tests of ineq. of coeff.:						
δ = Post-$SOX^{MoreAffected}$ - Post-$SOX^{LessAffected}$		*0.011***		*0.012**		*0.009*
H_0: δ = 0, H_A: δ > 0 {p-value}		*{0.013}*		*{0.066}*		*{0.121}*

Panel C

Pair-Matching Analysis

More Affected Group:	Matched Group	*$\delta = ROA^{Seg.-MoreAffected}(t+1) - ROA^{Seg.-Matched}(t+1)$* *$H_0$: δ = 0, H_A: δ > 0 {p-value}* Pre-SOX	Post-SOX
Multi-Segment Firms	Single-Segment Firms	1.54%***	2.36%***
		{0.003}	*{0.000}*
Multi-Seg. Firms with #B.Seg. = 2	Single-Segment Firms	0.78%	1.10%*
		{0.119}	*{0.069}*
Multi-Seg. Firms with #B.Seg. ≥ 3	Multi-Seg. Firms with #B.Seg. = 2	-0.27%	2.19%***
		{0.878}	*{0.004}*
Smaller Segments AT^{Seg}/AT^{Firm} < 1/#B.Seg.	Larger Segments AT^{Seg}/AT^{Firm} > 1/#B.Seg.	-0.55%	0.47%
		{0.774}	*{0.209}*

These results are consistent with the theory and Hypothesis 1.2. Since top executives have better information on segment performance after SOX, they will rely more on it, and thus their allocating decision will be more efficient (i.e., closer to the first-best solution [see Harris and Raviv, 1996]). It is also more difficult for divisional managers to create opaque internal accounting systems and to hide information after SOX. In other words, after SOX the marginal costs of lobbying increase and, thus, internal capital allocations are more efficient (Scharfstein and Stein, 2000)

I also investigate the change of profitability across segments within the firm. I expect that the effects of SOX will be more pronounced for divisions that are more prone to asymmetric information problems. To the extent that smaller segments in the firm are likely to be younger ones and that the CEO has less knowledge about them; I expect that information problems should be more severe for smaller segments. Moreover, due to limitation in acquiring specific knowledge, CEOs are likely to focus their attention on the core-business of the firm, that is, the larger divisions (Ozbas and Selvili, 2009). I define smaller (larger) segments as segments for which the ratio of segment-to-firm assets is below (above) one divided by the number of segments. I find that the profitability of smaller segments compared to larger segments within the conglomerate tends to increase more, although the difference is not significant (see Panel B: +1.6% for larger segments and +2.5% for smaller segments). In the pair-matching analysis (Panel C), I observe that larger segments tend to outperform smaller

segments before SOX, whereas, it is the opposite after SOX. However the differences are not significant in both periods.

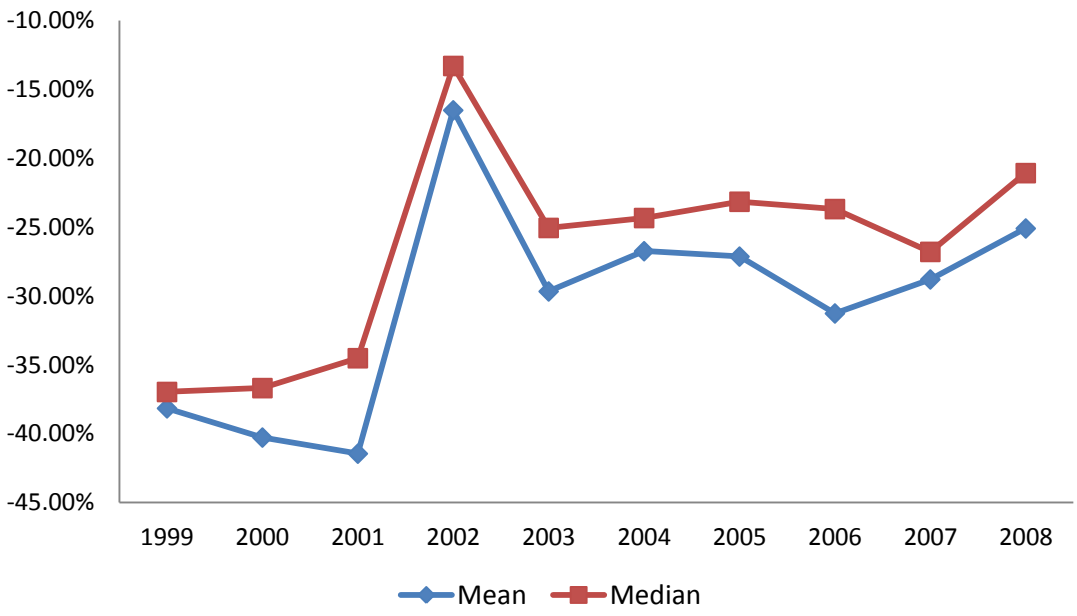
1.5.8 Change in the Conglomerate Discount

I study the change in market value of conglomerate firms relative to stand-alone firms. To the extent that internal capital markets are more efficient after SOX, I expect that the market-value of conglomerate firms relative to stand-alone firms will increase after the announcement of the Act. I follow Berger and Ofek (1995) to compute the excess value of conglomerate value relative to stand-alone firms. The excess value is defined as the natural logarithm of the ratio of a firm's market-value to its imputed value. A firm's imputed value is the sum of its segments' imputed values, which are the product of the segments' total sales and the median market-to-sales ratio of single-segments firms in the same industry. Industry is defined by the narrowest 4-digit, 3-digit, or 2-digit SIC code for which there are at least five single-segment firms. The market-to-sales ratio represents the ratio of firm market value (market capitalization minus book common equity plus total assets) by total sales at the end of fiscal year. I restrict my sample to firms the fiscal year of which ends between September 1 and December 31 and whose market capitalization is greater than 75 million dollars. Consistent with previous findings, the excess value is negative and, thus, is commonly known as

the conglomerate discount.[40] I plot this discount between 1999 and 2008 in Figure 1.1.

Figure 1.1. Conglomerate Discount by Year

Figure 1.1 shows the mean and median excess value of multi-segment firms from fiscal year end 1999 to 2008. Firm excess value is defined as the natural logarithm of the ratio of a firm's market value to its imputed value. A firm's imputed value is the sum of its segments' imputed value, which are the product of the segments' total sales and the median market-to-sales ratio of single-segments firms in the same industry (Berger and Ofek, 1995). Industry is defined by the narrowest 4-digit, 3-digit, or 2-digit SIC code for which there are at least five single-segment firms. The market-to-sales ratio represents the ratio of firm market value (market capitalization minus book common equity plus total assets) by total sales at the end of fiscal year. The sample includes single and multi-segment firms with market capitalization greater than 75 million dollars and with their fiscal year ending between September 1 and December 31.



[40] The magnitude of the discount is larger than in previous studies because I drop small single-segment firms. I find that the conglomerate discount is very sensitive to the inclusion of small firms since it is based on the median statistics to compute segment imputed value. If I include small single-segment firms, the range of the discount would be 10% to 20%, which is consistent with previous findings.

I observe that the conglomerate discount sharply decreases after the announcement of SOX in 2002. However, the discount increases significantly in 2003 and then remains relatively stable afterwards. Over the sample period, the only significant variations over the year are from 2001 to 2002 and from 2002 to 2003. Although the discount increases in 2003, its level during the period 2003-2006 is significantly lower than in 1999-2001. The sharp decrease in the discount in 2002 could be driven by over-reaction and also be influenced by the burst of the tech bubble. Indeed many factors influence the conglomerate discount, and to analyze the value of diversification is beyond the scope of this paper. I therefore consider the fact that the discount decreases at SOX announcement and remains at a lower level in the following years to be additional evidence supporting Hypothesis 1.2: SOX has a positive impact on the efficiency of internal capital markets.

1.6 Robustness Checks Analysis

1.6.1 Alternative Investment and Performance Definitions

In this subsection, I check the robustness of my results to a change in variable definitions. The results are reported in Table 1.9. I employ alternative investment and performance definitions. I use the ratio of segment-to-firm capital expenditure as the dependent variable, which basically represents the proportion of new invested capital in each segment. Consistent with the previous results, I observe that better-performing segments tend to receive a larger fraction of the new invested capital after SOX. In column (3) and (4), I also change the definition

of performance—I substitute ROA for the ratio of segment-to-firm operating profit. I find that after SOX, firms assign a larger fraction of their new invested capital to segments that represent a larger fraction of their operating profit, which is consistent with my previous results.

Table 1.9. Robustness Checks: Alternative Investment and Performance Definitions

Table 1.9 shows results of OLS fixed-effects regressions for a sample of multi-segment firms with market capitalization greater than 75 million dollars for 2001-2006. *Post-SOX* is a dummy variable that takes the value of one if the fiscal year ends after November 15, 2004. *ROA* equals operating profit divided by assets at fiscal year end. *Op. Profit* is the operating profit of the segment (*Seg*) or total operating profit of the firm (*Firm*). *ROA* equals operating profit divided by assets at fiscal year end. Robust standard errors clustered at the segment level are reported in parentheses. P-values of the tests of inequality of the coefficients are reported in braces. Asterisks indicate statistical significance at the 1% (***), 5% (**), or 10% (*) level.

Dependent Variable:	$CAPX^{Seg}(t) / CAPX^{Firm}(t)$			
	(1)	(2)	(3)	(4)
Pre-SOX * $[ROA^{Seg}(t-1) - ROA^{Firm}(t-1)]$	0.014	0.005		
	(0.022)	(0.022)		
Post-SOX * $[ROA^{Seg}(t-1) - ROA^{Firm}(t-1)]$	0.134***	0.133***		
	(0.025)	(0.026)		
Pre-SOX * $Op.Profit^{Seg}(t-1) / Op.Profit^{Firm}(t-1)$			0.023***	0.022**
			(0.008)	(0.008)
Post-SOX * $Op.Profit^{Seg}(t-1) / Op.Profit^{Firm}(t-1)$			0.045***	0.045***
			(0.010)	(0.010)
Pre-SOX * $[Q^{Ind\text{-}Seg}(t-1) - Q^{Ind\text{-}Firm}(t-1)]$		-0.006		-0.005
		(0.008)		(0.008)
Post-SOX * $[Q^{Ind\text{-}Seg}(t-1) - Q^{Ind\text{-}Firm}(t-1)]$		0.034***		0.032***
		(0.008)		(0.008)
Year F.E.	Y	Y	Y	Y
Segment F.E.	Y	Y	Y	Y
# Obs.	6,908	6,908	6,908	6,908
Within R^2	0.007	0.011	0.009	0.013
R^2	0.914	0.915	0.914	0.915
Tests of inequality of coefficients:				
*δ = Post – Pre-SOX * $[ROA^{Seg} - ROA^{Firm}]$*	*0.120****	*0.128****		
*δ = Post – Pre-SOX * [$Op.Profit^{Seg}$ / $Op.Profit^{Firm}$]*			*0.022****	*0.023****
H_0: δ = 0, H_A: δ > 0 {p-value}	*{0.000}*	*{0.000}*	*{0.007}*	*{0.004}*

1.6.2 Implementation Date Check, Business Cycle Check, and Placebo Test

1.6.2.1 Implementation Date Check

Since SOX contains multiple provisions that potentially could have influenced the allocation decision and there might have been some delay in the understanding of the new rules, there is some uncertainty with regard to the actual date SOX was implemented. In my baseline specification, I use the year 2004 (implementation of Section 404) to identify the post-SOX period. However, other provisions implemented in 2003, such as Section 302 and Section 906 would impact the allocation decision. In addition, SOX provisions were announced in 2002 and, thus, firms could have adjusted their investment policy before the implementation date. Conversely, it is possible that firms might have not fully understood the new rule at the implementation date and, thus, the adjustment in the allocation decision would occur later. To control for these issues, I drop the years 2003 and 2004 and investigate the change in responsiveness of investment to past performance. The results are reported in columns (1) and (2) of Table 1.10.

Consistent with my previous results, before SOX there is no significant sensitivity of investment to performance while it is significant after SOX—the increase is significant.

Table 1.10. Implementation Date Check, Business Cycle Check, and Placebo Test

Table 1.10 shows results of OLS fixed-effects regressions for a sample of multi-segment firms with market capitalization greater than 75 million dollars. The sample period is fiscal year 2001-2002 and 2005-2006 *(Implementation Date Check)*, fiscal year 1999-2000 and 2005-2006 *(Business Cycle Check)*, and fiscal year 1999-2002 *(Placebo Test)*. *Post-SOX* is a dummy variable that takes the value of one if the fiscal year ends after November 15, 2004. *Post-SOX (Placebo)* is a dummy variable that takes the value of one for fiscal years 2001 and 2002. *ROA* equals operating profit divided by assets at fiscal year end. $Q^{Ind\text{-}Seg}$ is the median of the market-to-book assets ratio for single-segment firms within the same industry as the segment. Industry is defined by the narrowest 4-digit, 3-digit, or 2-digit SIC code for which there are at least five single-segment firms. $Q^{Ind\text{-}Firm}$ is the assets-weighted average $Q^{Ind\text{-}Seg}$ of the firm. Robust standard errors clustered at the segment-level are reported in parentheses. P-values of the tests of inequality of the coefficients are reported in braces. Asterisks indicate statistical significance at the 1% (***), 5% (**), or 10% (*) level.

Dependent Variable:	$CAPX^{Seg}(t) / AT^{Seg}(t-1) - CAPX^{Firm}(t) / AT^{Firm}(t-1)$					
	Implementation Date Check		Business-Cycle Check		Placebo Test	
	[2001-2002] & [2005-2006] Period		[1999-2000] & [2005-2006] Period		[1999-2002] Period	
	(1)	(2)	(3)	(4)	(5)	(6)
Pre-SOX * $[ROA^{Seg}(t-1) - ROA^{Firm}(t-1)]$	0.041	0.035	-0.020	-0.023	0.037	0.039
	(0.043)	(0.043)	(0.059)	(0.060)	(0.041)	(0.041)
Post-SOX * $[ROA^{Seg}(t-1) - ROA^{Firm}(t-1)]$	0.120***	0.118***	0.101**	0.098**		
	(0.039)	(0.039)	(0.048)	(0.048)		
Post-SOX(Placebo)*$[ROA^{Seg}(t-1) - ROA^{Firm}(t-1)]$					0.058	0.059
					(0.049)	(0.048)
Pre-SOX * $[Q^{Ind\text{-}Seg}(t-1) - Q^{Ind\text{-}Firm}(t-1)]$		0.001		-0.001		0.007
		(0.006)		(0.004)		(0.005)
Post-SOX * $[Q^{Ind\text{-}Seg}(t-1) - Q^{Ind\text{-}Firm}(t-1)]$		0.017**		0.018**		
		(0.008)		(0.009)		
Post-SOX(Placebo)*$[Q^{Ind\text{-}Seg}(t-1) - Q^{Ind\text{-}Firm}(t-1)]$						0.012
						(0.008)
Year F.E.	Y	Y	Y	Y	Y	Y
Segment F.E.	Y	Y	Y	Y	Y	Y
# Obs.	4,560	4,560	4,685	4,685	4,487	4,487
Within R^2	0.017	0.021	0.011	0.014	0.007	0.010
R^2	0.670	0.671	0.691	0.691	0.634	0.635
Tests of inequality of coefficients:						
*δ = Post – Pre-SOX * $[ROA^{Seg} - ROA^{Firm}]$*	*0.079****	*0.083****	*0.121***	*0.121***		
δ = Post(Placebo)–Pre-SOX$[ROA^{Seg}–ROA^{Firm}]$*					*0.021*	*0.020*
H_0: δ = 0, H_A: δ > 0 {p-value}	*{0.009}*	*{0.006}*	*{0.024}*	*{0.026}*	*{0.311}*	*{0.323}*

In addition, I find that the increase in sensitivity is larger and more significant than in the baseline specification, which to some extent justifies the concern about identifying the control and affected period. In addition, these results also suggest that the effects of SOX on the allocation decision would potentially be stronger than the ones reported in the baseline specification.

1.6.2.2 Business Cycle Check and Placebo Test

Recent findings show that economic activities and access to external capital influence the performance and behavior of conglomerate firms relative to stand-alone firms (Dimitrov and Tice, 2006). It is therefore possible that my results are driven by changes in the economic activity in the United States during the period where SOX was implemented. I check whether the business cycle influences my results by using different control periods (i.e., period before SOX) and employ a pre-SOX period similar to the affected period (i.e., the period after SOX) in terms of business cycle. I impose a date for the new control period that is after the implementation of SFAS 131 in order to avoid any misclassification of segments due to the change of disclosure regulation. The new control period is 1999-2000, which represents a period similar in the business cycle as the affected period (2005-2006) according to the NBER US Business Cycle Expansions and Contractions Table. [41] Both periods are close to the end of an expansion cycle. The results are reported in columns (3) and (4) of Table X. The results are

[41] I do not include 1998, since past performance would be affected by the change of regulation. In order to have similar period length, the affected period will represent 2 years. Conclusions do not change if I employ a 3-year period.

consistent with the main findings. The responsiveness of investment to performance increases significantly after SOX.

I also run a placebo test using only the two periods before SOX (1999-2000 and 2001-2002). The results are reported in columns (5) and (6) of Table III. I find no significant change in the responsiveness of investment to performance. These results indicate that the responsiveness of investment to performance does not vary because of changes in the business cycle. Therefore, I conclude that the change of responsiveness of investment to performance is not driven by changes in US economic activity around SOX.

Capital constraints might prevent firms from adopting the optimal investment strategy. In addition to investigating that the changes in the allocating decision are not related to the business cycle, I look at the interaction of the change in responsiveness with cash reserves. In case of external financing constraints, segment profitability will be considered more as a vehicle of liquidity easing financing constraints than as a signal of performance. Firms can respond to new information more easily when they are less financially constrained (Chen, Goldstein, and Jiang, 2007). I find that cash reserves do not influence the change in internal capital allocation decision. The changes in responsiveness of investment to performance interacted with cash reserves are not significantly different from zero.[42]

[42] These results are not reported but available upon request.

1.6.3 Agency Conflicts Between the Management and Shareholders (or Directors)

1.6.3.1 Board Structure

SOX and concomitant governance regulations in the New York Stock Exchange and NASDAQ have improved the external monitoring environment and the transparency of publicly traded firms and, thus, my results could be driven by the decrease of agency conflicts between the management and the investors (or the board of directors). As shown in the model by Scharfstein and Stein (2000), both layers of information problems or conflicts of interests (first layer: between top executives and investors (or the board of directors); second layer: between the division managers and top executives) could influence the allocating decision. In addition, previous findings suggest that when executive ownership and block ownership are larger, internal allocations tend to be more efficient (Scharfstein, 1998; Ozbas and Scharfstein, 2010; Sautner and Villalonga, 2010). It is therefore possible that my results are driven by changes in the agency conflicts between management and shareholders. To address this concern, I first study firms that were affected by the regulations concerning the independence of the board of directors. I obtain data about board characteristics from Corporate Library database. The results are reported in Table 1.11.

I find that firms the board compositions of which do not satisfy the board independence requirements before SOX (*Non-Compliant Firms*) do not exhibit significant changes in their capital allocation decisions. Actually, the change of

responsiveness of investment to performance is negative (but not significant). In addition, these results are not driven by firms' and segments' characteristics since there is a significant increase in the sensitivity for a matched-pair sample (see results in columns (3) and (4)).

Table 1.11. Respons. of Invest. to Perf. For Firms with Non-Inde. Board in 2001

Table 1.11 shows results of OLS fixed-effects regressions for a sample of multi-segment firms with market capitalization greater than 75 million dollars for 2001-2006. *Non-Compliant Firms* represents a sample of firms for which the board of director does not have a majority of independent directors in the 2001 annual meeting (proxy year). *Post-SOX* is a dummy variable that takes the value of one if the fiscal year ends after November 15, 2004. *ROA* equals operating profit divided by assets at fiscal year end. The pair-matching is based on number of segments in the firm (*required*), whether the ratio of segment-to-firm assets is greater or smaller to one divided by number of segments (*required*), $Q^{industry}$ (*closest – 1st criteria*) and segment assets (*closest – 2nd criteria*). Robust standard errors clustered at the segment level are reported in parentheses. P-values of the tests of inequality of the coefficients are reported in braces. Asterisks indicate statistical significance at the 1% (***), 5% (**), or 10% (*) level.

Dependent Variable: $CAPX^{Seg}(t) / AT^{Seg}(t-1) - CAPX^{Firm}(t) / AT^{Firm}(t-1)$				
	Non-Compliant Firms		Sample Selection Check: Matched-Pair Sample	
	(1)	(2)	(3)	(4)
Pre-SOX * $[ROA^{Seg}(t-1) - ROA^{Firm}(t-1)]$	0.373**	0.358**	0.072	0.064
	(0.149)	(0.155)	(0.071)	(0.069)
Post-SOX * $[ROA^{Seg}(t-1) - ROA^{Firm}(t-1)]$	0.304***	0.274***	0.152*	0.153**
	(0.027)	(0.040)	(0.077)	(0.076)
Pre-SOX * $[Q^{Ind\text{-}Seg}(t-1) - Q^{Ind\text{-}Firm}(t-1)]$		-0.003		-0.009
		(0.014)		(0.021)
Post-SOX * $[Q^{Ind\text{-}Seg}(t-1) - Q^{Ind\text{-}Firm}(t-1)]$		-0.047		-0.027
		(0.042)		(0.021)
Year F.E.	Y	Y	Y	Y
Segment F.E.	Y	Y	Y	Y
# Obs.	220	220	220	220
Within R^2	0.349	0.374	0.062	0.074
R^2	0.793	0.801	0.608	0.613
Tests of inequality of coefficients:				
*δ = Post – Pre-SOX * $[ROA^{Seg} - ROA^{Firm}]$*	*-0.069*	*-0.084*	*0.080***	*0.089***
H_0: $\delta = 0$, H_A: $\delta > 0$ {p-value}	*{0.796}*	*{0.777}*	*{0.017}*	*{0.011}*

1.6.3.2 Ownership Structure

I check whether the ownership structure affects my results by studying the effects of management and block ownership on the responsiveness of investment to performance. Management (Block) Ownership is the fraction of outstanding shares held by top executives and directors (by 5% or greater shareholders). I collect the data from Corporate Library database. The results are reported in Table 1.12.

There is no significant influence of executive ownership or block ownership on the change of responsiveness of investment to performance. The changes in responsiveness of investment to performance interacted with executive ownership as well as with block ownership are not significantly different from zero. Thus, although there might be some difference in responsiveness across firms depending on their ownership structure, the change before and after SOX within the firm is not related to the ownership structure.

These results suggest that my results are not driven by changes in the external monitoring environment.

Table 1.12. Respons. of Invest. to Perf. by Mngmt Ownership and Block Ownership

Table 1.12 shows results of OLS fixed-effects regressions. Management (Block) Ownership is the fraction of outstanding shares held by top executives and directors (5% or greater shareholders). Both Mngmt Ownership and Block Ownership are winsorized at 1% in each tail. Robust standard errors clustered at the segment level are reported in parentheses. P-values of the tests of equality of the coefficients are reported in braces. Asterisks indicate statistical significance at the 1% (***), 5% (**), or 10% (*) level.

Dependent Variable: $CAPX^{Seg}(t) / AT^{Seg}(t-1) - CAPX^{Firm}(t) / AT^{Firm}(t-1)$						
	Management Ownership and Responsiveness			Block Ownership and Responsiveness		
	(1)	(2)	(3)	(4)	(5)	(6)
Pre-SOX * $[ROA^{Seg}(t-1) - ROA^{Firm}(t-1)]$	0.055	0.053	0.052	0.078	0.076	0.078
	(0.038)	(0.038)	(0.037)	(0.051)	(0.051)	(0.051)
Post-SOX * $[ROA^{Seg}(t-1) - ROA^{Firm}(t-1)]$	0.105**	0.102**	0.102**	0.129***	0.126***	0.127***
	(0.044)	(0.045)	(0.045)	(0.040)	(0.040)	(0.040)
Management Ownership	0.009	0.007	0.005			
	(0.007)	(0.007)	(0.007)			
MgtO.*Pre-SOX * $[ROA^{Seg}(t-1) - ROA^{Firm}(t-1)]$	0.009	0.004	0.018			
	(0.110)	(0.108)	(0.105)			
MgtO.*Post-SOX * $[ROA^{Seg}(t-1) - ROA^{Firm}(t-1)]$	-0.092	-0.078	-0.054			
	(0.094)	(0.094)	(0.089)			
Block Ownership				-0.007	-0.007	-0.006
				(0.016)	(0.016)	(0.016)
BlockO.*Pre-SOX * $[ROA^{Seg}(t-1) - ROA^{Firm}(t-1)]$				-0.078	-0.084	-0.089
				(0.142)	(0.134)	(0.137)
BlockO.*Post-SOX * $[ROA^{Seg}(t-1) - ROA^{Firm}(t-1)]$				-0.186	-0.179	-0.183
				(0.123)	(0.119)	(0.119)
Pre-SOX * $[Q^{Ind\text{-}Seg}(t-1) - Q^{Ind\text{-}Firm}(t-1)]$		0.002	0.002		0.001	0.005
		(0.007)	(0.008)		(0.007)	(0.009)
Post-SOX * $[Q^{Ind\text{-}Seg}(t-1) - Q^{Ind\text{-}Firm}(t-1)]$		0.011*	0.003		0.012*	0.019**
		(0.006)	(0.007)		(0.006)	(0.009)
MgtO.*Pre-SOX * $[Q^{Ind\text{-}Seg}(t-1) - Q^{Ind\text{-}Firm}(t-1)]$			-0.015			
			(0.030)			
MgtO.*Post-SOX * $[Q^{Ind\text{-}Seg}(t-1) - Q^{Ind\text{-}Firm}(t-1)]$			0.066*			
			(0.036)			
BlockO.*Pre-SOX * $[Q^{Ind\text{-}Seg}(t-1) - Q^{Ind\text{-}Firm}(t-1)]$						-0.025
						(0.028)
BlockO.*Post-SOX * $[Q^{Ind\text{-}Seg}(t-1) - Q^{Ind\text{-}Firm}(t-1)]$						-0.039
						(0.032)
Year F.E.	Y	Y	Y	Y	Y	Y
Segment F.E.	Y	Y	Y	Y	Y	Y
Observations	3,681	3,681	3,681	3,763	3,763	3,763
Within R^2	0.015	0.017	0.019	0.016	0.018	0.018
R^2	0.647	0.648	0.649	0.639	0.639	0.640
Tests of equality of coefficients:						
$\delta = MgtO.*Post - Pre\text{-}SOX * [ROA^{Seg} - ROA^{Firm}]$	*-0.101*	*-0.082*	*-0.072*			
$\delta = BlockO.*Post - Pre\text{-}SOX* [ROA^{Seg} - ROA^{Firm}]$				*-0.108*	*-0.095*	*-0.094*
$H_0: \delta = 0, H_A: \delta = 0$ {p-value}	*{0.483}*	*{0.561}*	*{0.576}*	*{0.503}*	*{0.528}*	*{0.530}*

1.7 Conclusion

In this paper, I investigate the effects of information problems across corporate hierarchies on internal capital allocation decisions by using the Sarbanes-Oxley Act (SOX) as a quasi-natural experiment of a shock to the level of information frictions across corporate hierarchies. SOX requires firms to enhance their internal control systems in order to improve the reliability of financial reporting across corporate hierarchies. I find that after SOX the capital allocation decision is more sensitive to performance as reported by the business segments. The changes in sensitivity of investment to performance are more pronounced for conglomerates that are more prone to information problems across corporate hierarchies. Moreover, in the post-SOX era, firms do not rely on past performance in their capital allocation decision when auditors report material weaknesses in their internal controls. The productivity advantage of conglomerates over stand-alone firms increases after SOX. In addition, conglomerates and segments that are more affected by SOX exhibit a larger increase in future profitability after SOX. Furthermore, the excess value of conglomerate firms relative to stand-alone firms increases (i.e., the conglomerate discount decreases). These changes in the internal capital allocation process are not associated with economic activities, financial constraints, or tensions between the management and shareholders.

My findings support the idea that after an increase in the reliability of internal financial reporting, top executives rely more on information reported by the division managers. By improving the within-firm information system, stronger

internal controls lead firms to adopt more efficient capital allocations and, thus, firm productivity increases after SOX. The results of this paper suggest that inefficiencies in the capital allocation process are partly due to information frictions across corporate hierarchies. It thus confirms predictions from a wide range of models that use within-firm frictions to explain inefficiencies in internal capital markets (e.g., Harris and Raviv, 1996; Scharfstein and Stein, 2000).

In addition, this study clarifies the impact of SOX—revealing the consequences of SOX for conglomerate firms from a new perspective and providing additional explanations for why large firms benefit more from SOX than do small firms (see, e.g., Chhaochharia and Grinstein, 2007). Larger firms are more likely to have multiple divisions and, thus, are more prone to information problems within the organization. By mitigating information problems, the implementation of SOX leads firms to make better investment decisions and thus increases their productivity. These findings also shed light on the importance of internal control systems in the efficiency of corporate decisions (Jensen, 1993).

Internal governance laws also influence incentives for firms to diversify their activities in the first place. By improving corporate transparency and outside investor protection, for instance, stronger corporate governance would decrease the benefits of diversification. Therefore, I believe it is important to further explore the effects of corporate governance laws on the value of corporate diversification, and I leave it for further research.

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CHAPTER 2

PAY FOR THE RIGHT PERFORMANCE

2.1 Introduction

CEO compensation in U.S. public firms has attracted a great deal of empirical work. Yet our understanding of the contractual terms that govern CEO compensation and especially how the compensation committee ties CEO compensation to performance is still incomplete. The main reason is that CEO compensation contracts are, in general, not observable. For the most part, firms disclose only the realized amounts that their CEOs receive at the end of any given year. The terms by which the board determines these amounts are not fully disclosed.[43]

The fact that the contractual terms are not fully observable has led researchers to doubt that such contracts optimally tie CEO compensation to performance. For example, Bebchuk and Fried (2003) argue that companies have decoupled compensation from performance and camouflaged both the amount and performance-insensitivity of pay. Morse, Nanda, and Seru (2011) show both theoretically and empirically that, with lack of transparency of compensation

[43] Regulation S-K of the Securities Exchange Act of 1934 items 402(b) and 402(c) requires the disclosure of some of the contractual terms regarding equity awards. However, no specific disclosure is required for the performance-based cash component of the executive contract. Even for equity-based awards, past research finds that many times firms were vague in their reporting (e.g., Bettis et al. 2010).

contracts, powerful managers have the ability to rig their performance-pay for their own benefit.[44]

In December 2006, the Securities and Exchange Commission (SEC) issued new disclosure requirements on CEO compensation.[45] These requirements came as a response to investor concerns that in recent years CEO compensation packages have not been properly disclosed or well understood.[46] According to these new requirements, firms now must provide additional information about the contractual terms of their compensation to the CEO. In particular, firms need to disclose the types of performance measures that they use to determine CEO rewards, the performance targets, and the performance horizon. We show that these requirements are binding: we document a significant change in the level of disclosure of CEO contractual terms after the rule.

We use this newly available data to examine how firms tie CEO compensation to performance and the extent to which such practices support the predictions of optimal contracting theories. We focus on three aspects of the pay-performance terms: first, we examine firms' choice to pre-specify performance goals in their

[44] Other empirical studies such as Yermack (1997), Bertrand and Mullainathan (2000, 2001), Lie (2005), Bebchuk and Jackson (2005), Kuhnen and Zwiebel (2008), and Bebchuk, Grinstein, and Peyer (2010), all point to the positive relation between lack of transparency in contractual terms and questionable pay-performance practices.

[45] The final rule is available online at http://www.sec.gov/rules/final/2006/33-8732a.pdf

[46] For example, SEC Chairman Cox commented that: "Over the last decade and half, the compensation packages awarded to directors and top executives have changed substantially. Our disclosure rules haven't kept pace with changes in the marketplace, and in some cases disclosure obfuscates rather than illuminates the true picture of compensation. This has led to concern that some companies may not be disclosing all compensation as is currently required. We have concluded that executive compensation disclosure requirements should be modified."

compensation contracts versus using their discretion in awarding the CEO. Second, we study firms' choice across the wide array of performance measures, and third, we examine firms' choice of performance horizon.

Our sample consists of firms in the Standard and Poor's (S&P) 500 index in fiscal 2007. We collect information from the proxy statements on the performance measures that are used in the CEO compensation contract in fiscal year 2007. We focus on identifying the different types of performance measures, their relative weights, and their horizons.

Across all firms in our sample, CEO compensation is given in the form of cash (e.g., bonuses and non-equity incentive plans), stocks, and option awards. The SEC distinguishes between *performance-based awards*, which are given for meeting pre-specified goals, and *other awards* (i.e., time-vesting awards and bonuses), which, for the most part, are given at the discretion of the board. We observe that 90% of our sample firms grant some type of performance-based awards. The average value of these awards is 4.8 million dollars. On average, 52% of the estimated value of CEO total awards is performance-based.

We first study the choice of the compensation committee between pre-specified performance-based awards and discretionary awards. In a complete-contracting framework, the compensation committee can pre-specify all relevant contingencies in the CEO compensation contract. However, in an incomplete

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(Chairman's Opening Statement; Proposed Revisions to the Executive Compensation and Related

contracting framework, it might be optimal for some firms not to pre-specify all of their performance goals. We argue that when firm's optimal strategies change rapidly over time, or when the activities of the CEO are too complex to be completely specified in the contract, then the firm will rely less heavily on pre-specified goals. We find evidence consistent with this argument: Firms assign a smaller fraction of the CEO awards to explicit measures when their strategies change more rapidly over time (e.g., investment-intensive firms, which are likely to face faster changes in business conditions), and when their activities are more complex.

Next, we examine the choice among performance goals. On average, firms pre-specify their performance goals over several performance measures. On average, 79% of the estimated value of performance-based awards is based on accounting-performance measures, 13% is based on stock-performance measures (i.e., market-based), and 8% is based on non-financial measures. Firms use a wide array of accounting measures. Firms reward CEOs based on income measures (e.g., earnings-per-share (EPS), net income growth, and earnings before interest and taxes (EBIT)), sales, accounting returns (e.g., return on equity, return on assets), cash flows, margins, cost-reduction measures, and EVA-type measures. On average, 56% of the estimated value of performance-based awards assigned to accounting measures is tied to income measures. A significant portion

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Party Disclosure Rules, January 17, 2006).

of the awards is also assigned to sales measures (12%) and accounting returns measures (17%).

We find that larger firms and firms with larger growth opportunities tend to rely more heavily on market-based measures, and firms that are more mature tend to rely more heavily on accounting-based measures. In addition, among accounting measures, sales are used by firms with larger growth opportunities, and accounting returns are used more heavily by more mature firms with fewer growth opportunities. We also find that firms in similar sectors tend to adopt similar performance measures. We find a weaker relation between performance horizon and firm characteristics, likely because of the tendency of firms to cluster over particular performance horizons.

Overall, our findings regarding the choice of performance measures support the optimal contracting theories. Consistent with the informativeness principle (Holmstrom, 1979), firms tend to choose performance measures that are more informative of CEO actions. Consistent with the incomplete contract theory, firms tend to rely more on pre-specified measures when the contractual costs are smaller (Hart, 1995).

Finally, we examine whether CEOs who have more ability to influence their compensation contract, will choose contractual terms that benefit them rather than increase shareholder value. We find some support to this argument: when shareholder monitoring is weaker, CEO awards tend to be more discretionary,

and the level of the discretionary portion is not correlated with past performance, present performance, or even future performance. However, regardless of the strength of shareholder monitoring, the portion of the award that is based on pre-specified goals seems to behave according to the optimal contracting theory. All the measures that we use for weak governance are not significantly related to the choice of performance measures. Thus, it seems that deviations from optimal contracting might potentially occur in the portion of the compensation that is less transparent and we interpret these results as weak evidence of deviation from optimal contracting.

Our study contributes to the existing literature in several ways. First, the disclosure rule allows us to document the large array of performance measures that are used in CEO compensation contracts and to examine firms' choices across the different measures. With the new data, we are able to directly examine the choice of different performance measures in CEO compensation contracts, and relate it to contracting theory. Past studies could not observe the choice of performance measures across the different components of compensation contracts because this data was not available. As a result, most studies have estimated the choice of performance measures from observed compensation outcomes.[47] Few previous empirical studies had access to more precise data

[47] Since data on performance measures was not available until recently, studies have used proxies instead. For example, Kole (1997) uses the level of non-equity awards as a proxy for accounting-based compensation and equity awards as a proxy for market-based compensation. Core, Guay, and Verrecchia (2003) use the ratio of total pay variance unexplained by stock returns to the variance of total pay explained by stock returns to study the use of price and non-price performance measures in CEO compensation. Lambert and Larcker (1987) study how changes in

regarding the terms of the contracts, but even then, the data was available only for particular components of the contract.[48]

Our second contribution is in analyzing the reasons behind tying CEO compensation to pre-specified performance goals. [49] The rich information on the variety of performance measures allows us to shed new light on the reasons behind performance choices and to contribute to the debate about CEO influence over pay practices.

Finally, we should note that the new compensation rules have led to a few other related studies that explore aspects of CEO compensation contracts. Their focus, however, is different than ours.[50]

The paper continues as follows. Section 2.2 is a brief review of the financial contracting literature relevant for optimal compensation design. In Section 2.3,

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cash compensation are explained by changes in return on equity (accounting performance measure) and firm stock return (market performance measure).

[48] See, for example, Bettis, Bizjak, Coles, and Kalpathy (2010), who analyze vesting provisions in stock and option grants; Sautner and Weber (2011), who study stock options plans for Europeans firms using proprietary data; and Ittner, Larcker, and Rajan (1997), who use proprietary data to investigate the use of financial and non-financial performance measures in CEO annual bonuses. With regard to non-executive employee compensation, see Bouwens and Van Lent (2007), who use survey data to study the performance metrics employed for periodic assessment, bonus decisions, and career paths of business unit managers.

[49] Gillan, Hartzell, and Parrino (2009) study whether the relationship between the firm and its CEO is governed by an explicit employee agreement. However, the scope of their paper is different than ours. They do not explore the choice of performance measures in the compensation contract.

[50] Grinstein, Weinbaum, and Yehuda (2011) study the impact of the 2006 disclosure rules on the amount of perquisites disclosed in CEO compensation. Kim and Yang (2010) compare earnings-per-share targets in the annual incentive plans to earnings expectations and explain their difference with corporate governance and firm characteristics. Wei and Yermack (2011) study investor reactions to the disclosure of CEO's deferred compensation. Finally, Cronqvist and Fahlenbrach (2011) utilize the new disclosure rule to examine changes in the contractual terms of firms that went private.

we explain the new disclosure requirements issued by the SEC. We describe the database in Section 2.4 and in Section 2.5 we provide an empirical analysis of how firms tie CEO compensation to performance. In Section 2.6, we study potential deviations from optimal contracting and the rationales for these deviations. Section 2.7 concludes. We also provide appendices in which we illustrate our data collection methodology and examine the effect of the rule on the level of disclosure.

2.2 Development of the Hypotheses

2.2.1 The Informativeness Hypothesis

In a standard moral-hazard problem, the shareholders (the principals) hire the CEO (the risk-averse agent) to complete a series of tasks to maximize shareholder wealth. Shareholders are risk neutral and do not observe CEO actions or level of effort. The action desired by the CEO differs from the one maximizing firm value; thus, the shareholders need to align CEO's incentives with their own. Holmstrom (1979) formulates the optimal compensation contract under the moral-hazard problem and defines the "Informativeness Principle," which means that optimal CEO compensation should depend on the likelihood that the action desired by shareholders is taken by the CEO. Thus, any performance measure that reveals partial information about the action taken (or level of effort provided) by the CEO should be included in the contract. Holmstrom shows that the optimal weight placed on a performance measure in the CEO contract exhibits a positive relation with the signal-to-noise ratio with respect to the CEO action. Hence, ceteris

paribus, there is a negative relation between the amount of noise of a performance measure and its use in the compensation contract.

H.2.1: (Informativeness Hypothesis) Ceteris paribus, firms tend to rely less on measures that are noisier signals of the CEO actions desired by shareholders.

What are CEO actions desired by shareholders? Clearly this depends on the strategy of the firm. Firms in different environments would develop different strategies in order to maximize shareholder value and these strategies are likely to vary across firms and over time. For example, for some firms the optimal strategy would be to focus on product development, while for others it would be to focus on reducing production costs or on developing new marketing strategies. According to the informativeness principle, directors should focus on the type of measure that is most informative of the desired action. For example, if the firm wants the CEO to develop new marketing strategies in order to increase value, it might wish to tie the CEO performance to sales-growth performance measures. Surely, there are other performance measures that the firm could consider, such as stock performance or profit margins. Both stock performance and profit margins measures are likely to be correlated with the desired actions of gaining market share, but there is likely a higher correlation of sales-growth performance measures with the desired actions than with the other measures (especially when stock-price measures and profitability measures capture other aspects of the firm and the industry, not related to the desired action). According to the

informativeness principle, firms should rely more heavily on the more informative performance measure – i.e., sales growth in this example.

Our approach in this study is to identify firm strategies and to examine whether the incentive contract conforms to these strategies. Unfortunately, strategies differ across firms and managers, and it is hard to pin down the exact desired strategy of every firm. However, industrial organization and strategy literature provides some basic guidance on the relevance of certain strategies depending on the type of environment in which the firm operates. One aspect is the life cycle of the firm and its products and the implication on firm strategies.[51] The basic premise in this literature is that young and growing businesses have plenty of profitable opportunities in which to re-invest earnings. However, as businesses mature, the opportunities become scarce. Managerial strategies should therefore be aligned with the life-cycle of the firm: managers in high-growth firms should be focused on activities that are aimed at long-term growth, (e.g., choosing the right projects to invest in, devising marketing strategies to introduce new products to the market, etc). As the firm matures, the growth opportunities become scarce, and managerial strategies should focus on achieving higher efficiency in production and pay excess cash to shareholders (Jensen 1986).

[51] Early mentioning of the firm life cycle include Penrose (1959) and Mueller (1972). Porter (1980) applies this framework in analyzing firm strategies. A large body of literature applies this framework to explain organizational choice and activity choice. See, e.g., Montgomery (1994) for a literature review, and Bernardo and Chowdhry (2002) for a rationalization of the firm life cycle within a firm-learning framework.

Another aspect is related to the ability of the firm to manage the scope of its operations. Larger firms and multi-division firms often engage more in acquisitions and in managing the scope and the size of their activities. Inevitably, CEOs in these firms control not only the level of future profits, but also the level of risk associated with these profits. In contrast, small firms are often specialized and engage in activities in one particular industry. Their CEOs have a more limited effect on the inherent risk in their activities. For large firms, we should therefore expect more reliance on performance measures that take into account the varying risk profile of firms' operations.

We use these principles to make predictions about firm's choice of performance measures depending on its growth and maturity stage as well as its ability to manage the scope of its activities.

2.2.1.1 Growth Opportunities and Maturity

Firms that are in their growth stage make large investments, for example, in R&D or in launching new products, and require managerial focus on achieving long-term outcomes. Therefore, accounting measures, which focus on current outcomes, will be poorer measures of optimal managerial actions than stock market performance, which focuses on the long-term prospects of the firm (Smith and Watts, 1992).[52]

[52] Consistent with this argument, Kole (1997) finds that firms with more intangible assets are more likely to adopt an equity compensation plan.

In addition, for firms that are in their growth stage, among accounting measures, market share and sales growth will be more relevant than profitability measures such as income measures or accounting returns. These firms are more concerned with establishing market share than with making large profits in the short run. According to the informativeness principle, we should therefore observe a positive relation between growth opportunities and the use of sales growth measures. In contrast, mature firms with fewer growth opportunities are more concerned about the efficiency of their investments and the redistribution of their profits. Consistent with a firm's life cycle argument, we therefore expect these firms to assign more weight to accounting performance measures.

Firms' growth opportunities should have also an effect on performance horizon. Since the impact of certain CEO decisions on firm value in growth firms is not immediate, it is important to measure the performance of the CEO over a longer horizon. Fudenberg, Holmstrom, and Milgrom (1990) show that the length of the managerial contract is positively related to the delay of the arrival of information. We should therefore expect firms in the growth stage to rely on long-term performance measures.

2.2.1.2 Managing Risk Profile

Past studies show that larger firms, and firms with multiple segments engage more in managing the risk of their firms' activities. For example, Amihud and Lev (1981) point to the tendency of managers in large, conglomerate firms to manage the risk profile of their operations through acquisition activities and

diversification strategies. In addition, larger firms are more prone to engage in hedging activities (see, e.g., Nance, Smith, and Smithson, 1993, and Mian, 1996).

To the extent that managing the risk profile of the firm is more important in larger organizations and organizations with multiple segments, we expect these organizations to use performance measures that take into account changes in the risk profile of the firm. Market-based measures take into account both the incremental cash flows from managing these activities as well as the risk in these cash flows. In contrast, accounting measures do not incorporate the risk profile of these activities and would therefore be a less precise measure of the desired strategy. We therefore predict larger firms and firms with more segments to rely more on market based performance measures.

In addition, the benefits of managing the risk-profile of the firm (e.g., diversifications and refocusing activities) are more likely to be realized over longer horizon than simple production activities. Therefore, performance measures in larger firms should be measured over a longer horizon.

2.2.2 Contract Incompleteness

Some firms do not tie large portions of the CEO compensation to any explicit measure. Instead, they use their discretion in determining the amount and type of award that they reward the CEO. Such a practice is more likely when it is costly to write all relevant performance contingencies into the contract (Hart, 1995, and Segal, 1999). For example, if renegotiation is costly and there is large uncertainty

regarding optimal CEO actions (which might get resolved only after the contract is signed), then the firm might be better-off not committing itself ex-ante to a specific performance measure. We identify two cases where pre-specified contracts are less desirable: when the strategy of the firm is not stable over time, and when firm activities are more complex. We describe these cases below.

2.2.2.1 Stability of Firm Strategy

When optimal strategy changes rapidly over time such that a contract that is written in the beginning of the year is not optimal later on, then the firm will face higher renegotiation costs and might be better-off not committing ex-ante to specific performance goals. We argue that firms that are in their growth phase are more likely to be in this situation. Such firms are often entering new markets and exploring new products. A contract that pre-specifies the desired CEO actions in the beginning of the year is less likely to be optimal later on either because competitors enter with new products, or because new technologies are identified in the market, or because of other changes in the firms' environment. It is more desirable in this case not to pre-specify performance goals in the CEO contracts because these goals are likely to change. Rather, the firm will use its own discretion in compensating the CEO once it observes the path that both the CEO and the industry took.

Another measure of the stability of firm optimal strategy is the seniority of the CEO. Arguably, else equal, firms whose strategies change rapidly over time are likely to replace their CEOs more often since not all CEOs are equally qualified to

implement different strategies. In contrast, firms whose strategies are stable are likely to retain their CEOs longer.Our prediction is therefore that firms whose CEOs have longer tenure are more likely to rely on pre-specified performance goals, while firms whose CEOs have shorter tenure are more likely to give discretion to the board with respect to CEO compensation.

2.2.2.2 Firm Complexity

The second case is when the firm is too complex such that the directors find it more difficult to identify optimal goals. We therefore expect complex firms to rely less on pre-specified performance goals and to provide more discretion to the board. We measure firm complexity through firm size and number of business segments in the firm.

We summarize these two arguments in the following hypothesis:

> *H.2.2: (Incomplete Contracting Hypothesis) Firms that are more complex and firms whose optimal strategy is less stable over time will rely less on pre-specified performance goals and will give more discretion to the board of directors regarding CEO compensation.*

2.2.3 Business Environment

Finally, there are other considerations in the business environment which are not captured by the previous arguments. To account for such considerations we also analyze the tendency of firms in similar sectors to adopt similar contractual terms.

Table 2.1. Hypotheses

Table 2.1 summarizes the hypotheses and their predicted effect on the explanatory variables.

	Test 1	Test 2			Test 3		Test 4
	Explicit-Performance Awards	Market	Accounting	Sales	Income	Accounting Return	Performance Horizon
• Optimal Contracting:							
Strategy Type:							
- Growth		+	-	+	-/+	-	+
- Managing Risk Profile		+	-				+
Cost of Contracting:							
- Stability of Firm Strategy	+						
- Firm Complexity	-						
• Deviations from Optimal Contracting:							
- Monitoring	+	+	-				+
- CEO Power	-	-	+				-

Firms in similar sectors tend to face similar technological constraints and similar prospects. As a result, CEO optimal tasks in firms in the same sector are likely to be related. Therefore, we expect similar contractual terms (including types of performance measures, performance horizon, and the level of discretion) for firms in the same sector.

Table 2.1 summarizes the empirical predictions in this section.

2.3 2006 Executive Compensation Disclosure Rules—Summary

In December 2006, the SEC issued new compensation disclosure requirements in order "…to provide investors with a clearer and more complete picture of compensation to principal executive officers" (see Background and Overview Section in the SEC Release No. 33-8732A). The two new components of interest for this study are improved narrative disclosure in the new Compensation Discussion and Analysis section and broader formatted tables that capture all compensation components and promote comparability.

In the Compensation Discussion and Analysis section, the registrants are now required to provide material information about compensation policies and must address the following questions:

i. What are the objectives of the company's compensation programs?

ii. What is the compensation program designed to reward?

iii. What is each element of compensation?

iv. Why does the company choose to pay each element?

v. How does the company determine the amount (and, where applicable, the formula) for each element?

vi. How do each element and the company's decisions regarding that element fit into the company's overall compensation objectives and affect decisions regarding other elements?

Firms are now also required to report performance measures and target levels considered by the compensation committee unless they can show that disclosing this information would result in competitive harm to the company.[53]

The SEC reorganizes the compensation tables into three categories:

i. Compensation with respect to the last fiscal year: the Summary Compensation Table and the Grants of Plan-Based Awards Table

ii. Holdings of equity-based interests that relate to compensation or are potential sources of future compensation: the Outstanding Equity Awards at Fiscal Year-End Table and the Option Exercises and Stock Vested Table

[53] Some commenters suggested that "competitive harm would be mitigated if disclosure were required on an after-the-fact basis, after the performance related to the award is measured" (see letters from American Federation of Labor and Congress of Industrial Organizations, dated April 5, 2006; Council of Institutional Investors; Governance for Owners; International Association of Machinists and Aerospace Workers; and The Honorable Barney Frank, United States Representative (MA)).

iii. Retirement and other post-employment compensation: the Pension Benefits Table and the Nonqualified Deferred Compensation Table

The SEC has also revised the Summary Compensation Table to "provide a clearer picture of total compensation" (see Figure 2.1). The main changes from previous requirements are that stock and option awards valuation is in accordance with FAS 123R. In addition, the components of the compensation are divided somewhat differently than before: Non-Equity Incentive Plan Compensation is the dollar amount earned in the fiscal year from a non-equity incentive plan. The Grants of Plan-Based Awards Table (Panel B) reports information for each grant awarded to the executive, especially future payout of both non-equity and equity grants at the threshold, target, and maximum performance levels. This table is accompanied by a narrative text explaining material factors necessary for understanding it. This includes, among other material factors, the performance measure and/or criteria used to determine the threshold, target, and maximum payout.

Figure 2.1. New Compensation Tables with Respect to Last Fiscal Year

Panel A: Summary Compensation Table

Name and Principal Position	Year	Salary ($)	Bonus ($)	Stock Awards ($)	Option Awards ($)	Non-Equity Incentive Plan Compensation ($)	Change in Pension Value and Nonqualified Deferred Compensation Earnings ($)	All Other Compensation ($)	Total ($)
PEO									
PFO									
A									
B									
C									

Panel B: Grants of Plan-Based Awards Table

Name	Grant Date	Estimated Future Payouts Under Non-Equity Incentive Plan Awards			Estimated Future Payouts Under Equity Incentive Plan Awards			All Other Stock Awards: Number of Shares of Stock or Units (#)	All Other Option Awards: Number of Securities Underlying Options (#)	Exercise or Base Price of Option Awards ($/Sh)
		Threshold ($)	Target ($)	Maximum ($)	Threshold (#)	Target (#)	Maximum (#)			
PEO										
PFO										
A										
B										
C										

Appendix 2.A illustrates the effect of the rule on the level of disclosure of a sample of 87 firms out of the S&P500 firms in our sample. For each firm we examine the level of disclosure of the different components of compensation in fiscal year 2005 (a year before the rule), in fiscal year 2006 (the first year after the rule) and in fiscal year 2007 (a year after the announcement of the rule). The appendix shows that while some firms have been disclosing information about the pay-performance relation even before the rule, there has been a significant increase in the level of disclosure of performance-based compensation arrangements, especially in non-equity awards.

In addition to having an effect on the level of disclosure, the regulation may also have some effects on the way firms compensate their CEO. For instance, it is possible that firms create the performance thresholds in order to identify the minimum, target and maximum levels of payoff to comply with the regulation. As a result, these potential new compensation practices may exacerbate nonlinearities in the compensation payoff. However, it is unlikely that the regulation would influence the choice of performance measures, which is the focus of our study.

2.4 Data and Variables

2.4.1 Data

We collect information about CEO compensation contracts from the proxy statements of public U.S. firms after the new SEC requirements took effect. Our

sample includes 494 firms that belong to the S&P 500 index as of December 2007.[54] S&P includes in this index the largest and most prominent U.S. firms. We focus on this set of firms for two main reasons. First, larger firms tend to provide more information about their practices and to comply with the SEC requirements early-on because of their visibility. Second, these firms are the largest in the U.S., and incentive schemes to management in these companies are likely to have a large effect on value.

For each firm, we read the section about CEO compensation in the proxy statement of fiscal year 2007. We use Compustat's definition of fiscal year, which means that fiscal year 2007 ends between 06/01/2007 and 05/31/2008.

We gather information from the discussion of the compensation arrangements, the summary compensation tables, and the grants plan-based awards tables in the proxy statements. Information about payoffs conditional on achieving certain performance targets is available in the discussion and in the footnotes of the grant plan-based tables. In appendix 2.B we illustrate how we gathered the information, using the IBM proxy statement as an example.

Several firms report one payoff for achieving targets across several measures, and they usually provide the different weights assigned to each measure. In the cases where firms do not disclose the weights, we assume that the payoff is

[54] We are not able to retrieve the proxy statements of 6 firms among S&P 500 members.

divided equally with respect to each performance measure.[55] This assumption is motivated by the fact that most firms that disclose weights use equal weights.

We find that firms classify awards into two categories. The first category consists of awards that are given for achieving a pre-specified performance goal. We call these awards performance-based awards. The second type of awards is given at the discretion of the board. We call these awards discretionary awards. For example, by-and-large stock option plans are considered discretionary awards since they are granted at the discretion of the board and they vest independently of performance.[56] Each type of award (pre-specified or discretionary) can be given in the form of cash, restricted stock, or options.

Panel A of Table 2.2 reports types of awards granted in our sample in fiscal year 2007. We also provide summary statistics of the values of these awards for firms that grant them.[57]

[55] A total of 106 firms do not disclose their weights for performance-based cash compensation, and 30 firms do not disclose their weights for performance-based stock compensation.

[56] For example, the option plan for the Microsoft Corporation states that the board has discretion to ..."determine the employees to whom, and the time or times at which, Options shall be granted and the number of shares to be represented by each Option…" (Microsoft 1991 Stock Option Plan, as amended and restated as of June 21, 2006. Section 4.b)

[57] With respect to the pre-specified performance-based awards, we define the value of the awards as the target payout for the non-equity incentive plan awards and the grant date fair value for the equity incentive plan awards (which is calculated in accordance to FAS123R. In the case of stock awards, the fair value represents the target number of shares to be paid out multiplied by the closing price at grant date).

Table 2.2. Components of CEO Compensation in 2007

Table 2.2 describes the different components of CEO compensation awarded in 2007 for a sample of 494 firms (S&P 500 members). We report the numbers and proportion of firms that grant the different types of awards. We also provide summary statistics of the (target) value of these awards for firms that grant these awards in thousands of dollars.

Panel A: Components of CEO Compensation in 2007

	# Firms with awards > 0	Proportion	Value of awards in thousands of $ (firms with awards > 0) Mean	Median	SD
Compensation in cash	492	99.60%	3690	2600	4062
- *Base Salary*	488	98.79%	1064	1000	511
- *Discretionary bonus*	100	20.24%	2691	1091	5391
- *Pre-specified performance awards (Non-Equity awards)*	425	86.03%	2433	1532	3172
Compensation in stock	386	78.14%	4593	3208	4511
- *Discretionary awards (Other Stock awards)*	214	43.32%	3546	2050	4581
- *Pre-specified performance awards (Stock Incentive Plan awards)*	257	52.02%	3945	2961	3394
Compensation in options	354	71.66%	4005	2825	5331
- *Discretionary awards (Other Option awards)*	342	69.23%	3880	2825	5052
- *Pre-specified performance awards (Option Incentive Plan awards)*	19	3.85%	4758	2421	6234
Any type of pre-specified performance-based compensation *(Non-Equity awards + Stock Incentive Plan awards + Option Incentive Plan awards)*	447	90.49%	4779	3496	5272

Panel B: Proportion of Awards Tied to Pre-specified Performance Measures

	N	Mean	SD	p25	Median	p75
Pre-specified performance-based awards/ Total awards *(excluding Base Salary)*	482	52%	30%	28%	53%	72%

Almost all of our sample firms grant some compensation in cash. Non equity awards represent the component of cash compensation given for achieving a pre-specified performance goal (i.e. performance-based cash awards) while annual cash bonuses are most of the time given at the discretion of the board—we will consider the discretionary bonus later in this section when we compute total awards to the CEO. For some firms, we find that the terms of the annual cash bonuses are pre-specified and so in these cases we classify these cash bonuses along with non-equity awards as performance-based cash compensation.[58] Six CEOs in our sample have a base salary less than or equal to $1, and about 86% of the CEOs receive performance-based cash awards. When granted, the targeted value of performance-based cash awards tends to be much larger than base salary (more than twice on average).

More than half of our sample firms grant pre-specified performance-based stock awards.[59, 60] This result contrasts with that of Bettis et al. (2010). They collected information about stock and option performance-vesting provisions for 2055 firms between 1995 and 2001 and found a total of 475 firms that granted at least one performance-vesting equity award over the seven years. Their final sample

[58] For 17 firms in our sample, we are able to retrieve the same type of information for the annual bonus as for the non-equity awards (performance measures used, performance thresholds, and payoff conditional on performance).

[59] We consider accelerated stock awards (11 observations) and accelerated options awards (3 observations) to be performance-based. These awards are accelerated (given ahead of time) if the manager reaches a pre-specified performance.

[60] A recent report by the independent consulting firm Frederick W. Cook & Co provides similar distributions of types of executives grants than ours (Frederick W. Cook & Co, 2010). In their sample of 250 firms, they find that 60% of the firms grant performance-based stock awards to their executives in 2007 (see 2008 report).

contained 1013 performance-based equity awards. Given their distribution of awards, the probability that a firm would grant a performance-based equity award in a given year was roughly 7%.[61] They find that very few firms provide performance-vested option awards, which is consistent with our findings. [62], [63] However, they also find very few performance-based stock awards in 2001, which is inconsistent with our findings. Sample differences could potentially account for the disparity in results between the two studies. Firms in our sample are much larger than firms in their study.[64] Our sample is also more recent, and compensation practices have likely changed due to regulations and changes in business practices.[65]

Overall, performance-based awards are important elements of CEO compensation in our sample. We observe that 90% of firms in our sample grant some type of performance-based award and the average value of these awards is approximately 4.8 million dollars.

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[61] Their distribution of the 1013 performance-based equity awards was: 240 firms in a single year, 100 in two years, 61 in three years, 26 in 4 years, 16 in five years, 18 in six years, and 14 in all seven years. Therefore, the probability that a firm grants a performance-based equity award in a given year is equal to 1013/(2055*7).

[62] Table 2 in their study reports that in 2001, 39 grants were accelerated option awards and 42 were performance contingent awards. Their sample size for the entire period is 2055 firms. We find 19 firms that report accelerated or performance contingent awards, out of 494 firms.

[63] Similarly, Frederic W. Cook & Co (2010) find that only 6% of their 250 sample-firms grant performance-based option awards in 2007.

[64] Median asset value in our sample is $11.8 Billion. Bettis et al. (2010) report that, in their sample, firms which gave grants had a median asset value of $1.168 Billion.

[65] For example, beginning in 2006, firms were required to expense options in their financial reports. This requirement may have led firms to shift from option compensation to stock-based compensation.

In Panel B, we compute the ratio of the value of performance-based awards to the value of total awards (which excludes base salary but includes performance-based awards, discretionary bonuses, time-vesting stock awards, and time-vesting options awards). On average, more than half of the value of the awards to the CEO is performance-based. This confirms the importance of understanding the role of performance-based awards in CEO compensation. We argue that this ratio captures the CEO explicit-performance incentives. For performance-based awards, the compensation committee selects ex-ante explicit-performance measures and performance targets, whereas non-performance-based awards are generally given at the discretion of the board.

We extract accounting data from the Compustat database, blockholder ownership and board of directors' characteristics from the Corporate Library database, and managerial compensation and ownership data from the Execucomp database. The terms of the CEO compensation contracts are hand-collected from each firm's proxy statement.

2.4.2 Variable Definitions and Summary Statistics

2.4.2.1 Contractual Terms

We study the pay-performance terms in the CEO compensation contract, focusing on two main terms: the types of performance measures and the number of years over which the performance is measured (duration).

We read each compensation report and look for whether the compensation is given for achieving a certain level of performance. We look separately at performance measures across non-equity awards, cash bonuses, stock awards, and options awards and aggregate the value assigned to each particular measure across all components. To estimate the proportion of the contract that is based on a particular performance measure, we rely on the disclosure of the target award associated with achieving the performance. The target award is the amount that CEOs are expected to receive if they meet the target performance, and firms provide this information for the different awards in the proxy statement. We note that the target award is sometimes given for achieving several targets. Whenever firms report the weights associated with each performance measure—for example, 30% of award Z is conditional on achieving earnings X, and 70% of award Z is conditional on achieving stock return Y—we use the weights to assign the respective value associated with each performance measure. In some cases, where the weights are not reported or are not identifiable, we assume that achieving each target contributes equally to the award.[66]

We acknowledge that estimating the portion of compensation attributed to each performance measure using the target compensation associated with each measure has some limitations. Some firms might assign targets that are harder to achieve than other firms, and we can neither observe the level of effort for achieving different targets, nor can we observe fully the curvature of the relation

[66] We assume equal weights because when firms do report the proportion of the award, they

between the performance and the payment. Nevertheless, we do not believe that this is a big concern for the purpose of our study because a firm that has some bias in choosing the target value of the awards is likely to have the same bias across different awards; thus, the proportion of the contract that is attributed to each performance measures will remain intact.

We observe three main types of measures: market-based measures, which are performance measures that are based on stock price performance; accounting-based measures, which are performance measures that are based on accounting variables; and non-financial measures, which are performance measures that are based on some subjective evaluations, such as customer satisfaction, corporate diversity, etc. In Panel A of Table 2.3, we observe that almost all firms that grant performance-based awards use at least one accounting-based performance measure, while market-based measures are less prevalent since less than a third of the sample firms are using market-based measures. Almost 40% of the firms that grant performance-based awards use non-financial performance measures.

Firms exhibit large variation in the use of accounting-based performance measures. Firms might award CEOs based on income measures (e.g., EPS, net income growth, EBIT), sales growth, accounting returns (e.g., return on equity, return on assets), cash flows, margins, cost reductions, and economic value added (EVA)-type measures. Most firms that use accounting-based measures use

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often assign equal weight to each award.

income measures, almost 40% use sales measures, and slightly less use accounting returns measures. The other measures are less prevalent.

Table 2.3. Contractual Terms of CEO Compensation in 2007

Table 2.3 describes the contractual terms of CEO compensation for a sample of 494 S&P 500 firms in 2007. Panel A and B report the proportions of firms using different types of performance measures. These proportions are computed for firms that grant performance-based awards and for which the respective performance measures are identified in their proxy statements. Panel C provides descriptive statistics about the number of different types of performance measures used and reports information about the performance-vesting horizon for firms that grant performance-based awards. Performance Horizon is the value-weighted average performance horizon, in years, for the different awards of the CEO.

Panel A: Types of performance measure

Stats \ Component	Accounting	Market	Non-financial
% of users among firms that grant perf.-based awards	98%	30%	39%

Panel B: Types of accounting performance measure

Stats \ Component:	Income	Sales	Acct. Return	Cash Flows	Margins	Cost Red.	EVA
% of users among firms that use accounting perf. measures	87%	39%	37%	23%	9%	6%	5%

Panel C: Number of performance measures & Performance Horizon

Stats \ Component	# Metrics	Performance Horizon
Mean	2.81	1.89
SD	1.29	1.00
p25	2	1
p50	3	1.81
p75	4	2.44
Min	1	0.25
Max	7	7.92
N	442	446

Figure 2.2. Average Proportion of Performance-based Awards and the Average Weights of Performance Measures

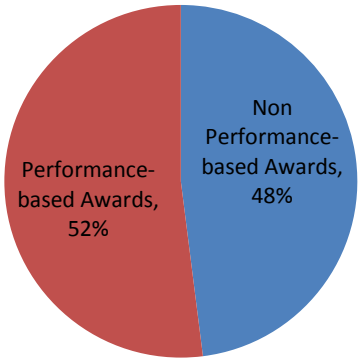

Figure 2.2.A: Performance-based Awards

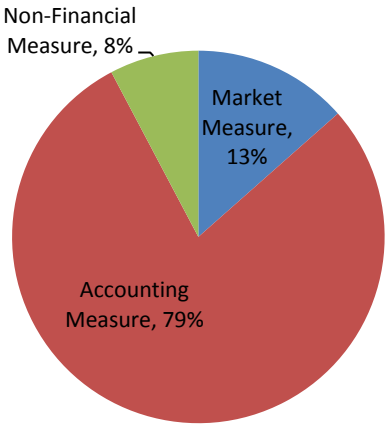

Figure 2.2.B: Type of Performance Measure

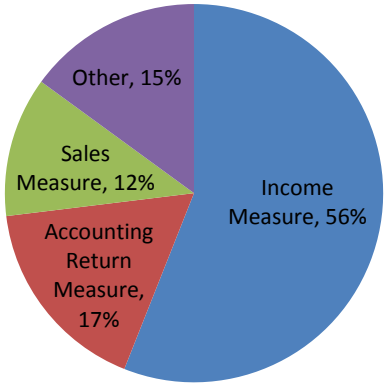

Figure 2.2.C: Type of Accounting Performance Measure

Figure 2.3. Average Proportion of Performance-based Awards, Average Weights of Performance Measures, and Average Performance Horizon by Sector

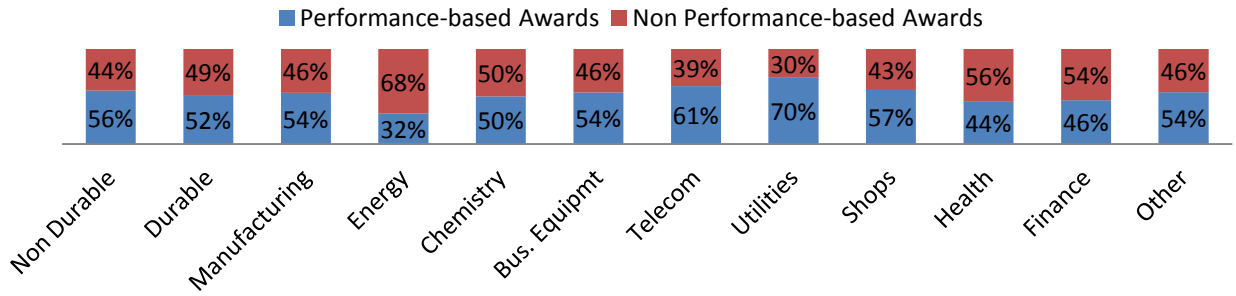

Figure 2.3.A: Performance-based Awards

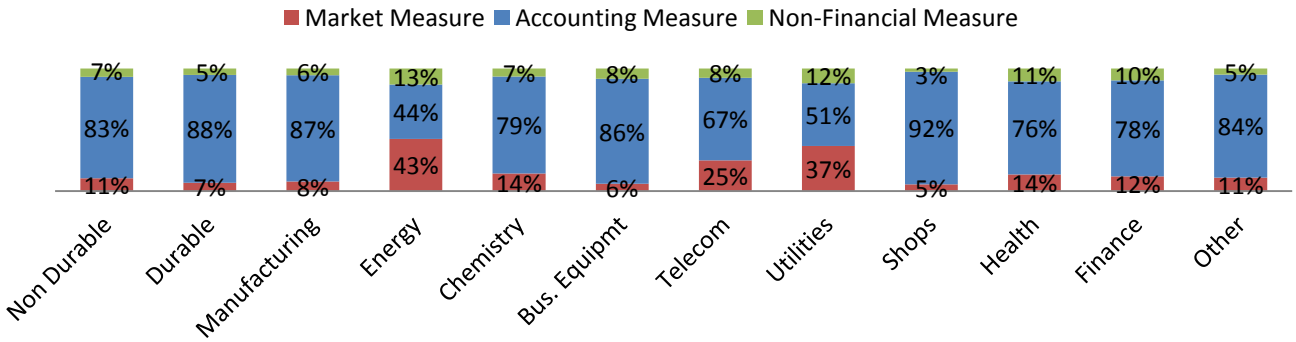

Figure 2.3.B: Type of Performance Measure

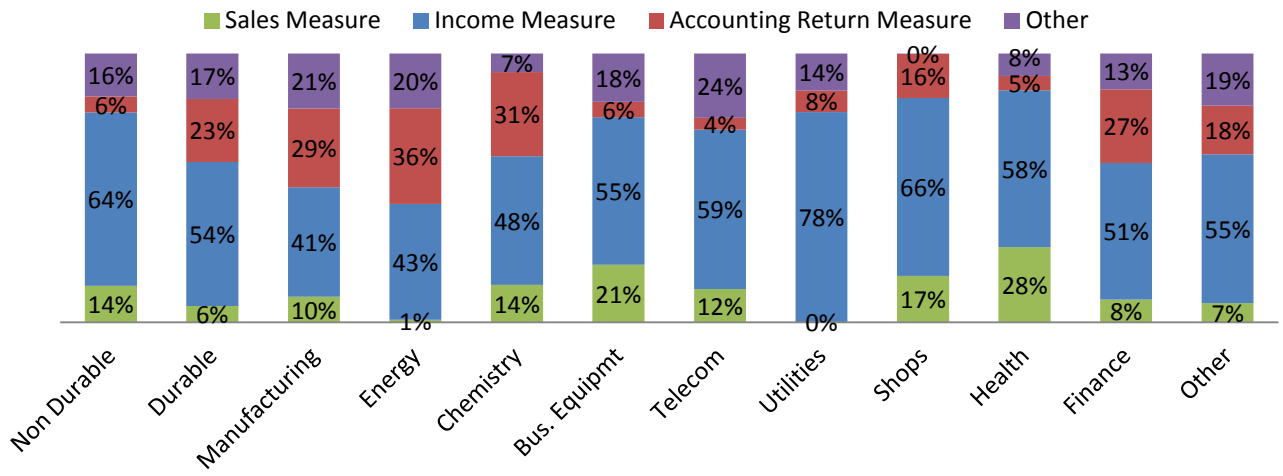

Figure 3.2.C: Type of Accounting Performance Measure

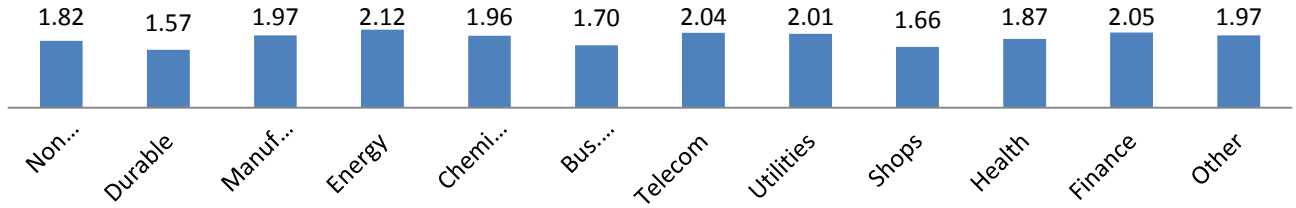

Figure 2.3.D: Performance Horizon (in years)

More than half of our sample firms that grant performance-based awards use between two and four different types of performance measures. For each performance measure, we also document the length of time for evaluating the performance. The performance horizon is the value-weighted average performance horizon for the different awards to the CEO. We observe a large variety of performance horizon, ranging from a quarter to almost eight years. On average the performance horizon of a given compensation contract is slightly less than two years.

In Figure 2.2 we plot the average CEO "contract" for our sample. Figure 2.2.A represents the average proportion of performance-based awards versus non-performance-based awards (excluding base salary but including discretionary bonuses, time-vesting stock awards, and time-vesting options awards). On average, more than half of the awards are performance-based. Figure 2.2.B shows the average fraction of the value of performance-based awards assigned to each type of performance measure. Accounting performance measures play a major role: on average, 79% of the performance-based awards are assigned to this type of measure. About 13% of the performance-based awards are assigned to market-based measures and 8% to non-financial measures. Even though more firms use non-financial measures compared to marked-based measures, the average fraction of performance-based awards value assigned to market-based measures is significantly higher. This result shows that firms that use market measures tend to assign a large award to these measures, while firms that use

non-financial measures tend to assign a smaller award to these measures. Figure 2.2.C shows the average fraction of the value of performance-based awards assigned to accounting measures to each type of accounting performance measure. On average, more than half of the accounting-based awards rely on income measures. We also observe substantial use of sales and accounting returns measures.

We plot the average CEO "contract" by industry sector in Figure 2.3. The sectors are defined according to Kenneth French's 12 industries classification. We observe similar patterns across sectors. In most sectors, the majority of the awards are performance-based. We observe that in only three sectors out of twelve the ratio of performance-based to non-performance-based awards is below 50% (Figure 2.3.A - Energy, Health and Finance). Accounting measures and income measures in particular are widely used in performance based awards. In all sectors, the largest fraction of performance-based awards is tied to accounting measures (Figure 2.3.B). Moreover, in all sector, the income measure is the accounting measure on which firms assign the largest weight. However, there are significant variations across sectors in the choice of performance measures (Figure 2.3.C). For instance, firms in the energy and utilities sectors assign more than a third of the value of performance-based awards to market-based measures, while firms in the durable goods, manufacturing, business equipment, and shops sectors assign a weight lower than or equal to 8% (Figure 2.3.B). The choice of sales measures also tends to be clustered by sector. No firm in the utility

sector uses sales measures, while firms in the health sector, which has high growth opportunities, assign on average 28% of the value of the award to sales performance (Figure 2.3.C). Overall, we observe that the nature of the sector in which the firm operates, matters in the design of CEO compensation.

2.4.2.2 *Explanatory Variables*

We use a host of explanatory variables to test the hypotheses associated with explicit-performance incentives and the choice of performance measures. The natural log of a firm's assets is a proxy for firm size, which aims to capture the importance to manage the risk profile of firms' activities. Firm assets are also a proxy for the complexity of firms' activities. We also use the number of business segments in the firm to measure the complexity of firms' activities as well as firm's tendency to manage the scope of its activities. To measure a firm's investment policy, we use the ratio of research and development expenses plus capital expenditures to total assets (Investment/A).[67] This measure is also a proxy for the growth opportunities of the firm as well as for the stability of firm's optimal strategy. As an additional measure of the firms' growth opportunities, we use the value-weighted average Tobin's Q of firm's industry (Q(ind)—industries

[67] We set the research and development expenses to zero if this variable is missing. Firms are required to report research and development expenses when these expenses are material. Therefore, when these expenses are immaterial, firms can omit from their reports the research and development expenses line in their income statement, and thus this item would be missing in the Compustat database. Following Loughran and Ritter (1997), we confirm the validity of this procedure by observing that no sample firm in the Chemistry industry has missing R&D items, and all sample firms in the Utilities industry have missing R&D items.

are classified according to the Fama-French 48 Industries classification). [68, 69] To measure firm maturity, we use the natural logarithm of firm age, defined by the year the firm was founded. Log CEO Tenure is a proxy for CEO experience and the stability of the firm's strategy. We use shareholder monitoring power and board leadership to measure the CEO's ability to affect board decisions (i.e., CEO power). We measure shareholder monitoring power by the ratio of shares held by the outside shareholders who held more than 5% of the total number of shares outstanding to the total number of shares outstanding. Investors who hold a large stake in the firm are less likely to suffer from the free rider problem and are more likely to affect board structure and firm decisions. Thus, in these firms we expect the CEO to have less ability to capture the board and to influence compensation decisions. With regard to board leadership, we use an indicator variable for the CEO as the chairman of the board to measure CEO power.

[68] Tobin's Q ratio is the ratio of market value of assets to book value of assets. The market value of assets equals to the book value of assets minus the book value of equity plus the market value of equity.

[69] There might be some reverse causality issue with the Investment/A variable since the investment decision could be affected by the terms in the CEO contract. To check the robustness of our results, we use only Q(ind) and not Investment/A as a proxy for growth opportunities. Our conclusions are not affected, but we get less significance in some specifications (due to the lower total variation in the explanatory variable: firm variations for Investment/A but only industry variations for Q(ind)).

Table 2.4. Explanatory Variables—Summary Statistics

Table 2.4 provides descriptive statistics for the explanatory variables used in this study for a sample of 494 S&P 500 members in 2007. The explanatory variables are from fiscal year 2006 data (unless stated otherwise). Log Assets is the natural logarithm of a firm's total assets (in millions). Investment/ A is a ratio of the sum of research and development expenses and capital and expenditure expenses to total assets. Q(ind) is the value-weighted average Tobin's Q ratio of firm's industry (we use the Fama and French 48 Industries classification). Log Firm Age is the natural logarithm of 2007 minus the year the firm was founded plus one. Log CEO Tenure is the natural logarithm of the difference between the end of 2007 and the date the executive became the CEO (expressed in years) plus one. Prop. Ownership by Blockholder 5% is the ratio of shares held by the outside shareholders who held more than 5% of the total number of shares outstanding to the number of shares outstanding. CEO Chairman is a dummy indicating whether or not the CEO was also the chairman of the board in fiscal year 2006. E Index is an entrenchment index based on six provisions: staggered boards, limits to shareholder bylaw amendments, poison pills, golden parachutes, and supermajority requirements for mergers and charter amendments (see Bebchuk, Cohen, and Ferrell, 2009).

Stats	Log Assets	# Business Segment	Investment/ A	Q(ind)	Log Firm Age	Log CEO Tenure	Prop. Ownership by Blockholder 5%	CEO Chairman	E index
Mean	9.52	2.69	0.07	2.25	3.63	1.75	0.17	0.53	2.29
SD	1.41	1.83	0.06	0.76	1.00	0.74	0.14	0.50	1.32
p25	8.49	1	0.02	1.71	3.04	1.23	0.06	0	1
p50	9.38	2	0.05	2.19	3.71	1.73	0.14	1	2
p75	10.31	4	0.09	2.72	4.48	2.23	0.24	1	3
Min	6.20	1	0.00	1.11	0.00	0.00	0.00	0	0
Max	14.45	8	0.36	3.77	5.41	3.82	1.00	1	5
N	494	494	491	489	494	494	472	494	451

We also include the entrenchment index (E index—see Bebchuk, Cohen, and Ferrell, 2009), which is based on six antitakeover provisions: staggered boards, limits to shareholder bylaw amendments, poison pills, golden parachutes, and supermajority requirements for mergers and charter amendments. Firms with a large E index have strong protection against hostile takeovers and thus it is more difficult to replace the incumbent CEO in these firms (i.e., the CEO has more power). Finally, in our regressions, we also include sector dummies that are classified according to the Kenneth French's 12 Industries classification system.[70] Table 2.4 provides descriptive statistics of the explanatory variables.

2.5 Empirical Analysis

2.5.1 Reliance on Pre-specified Performance Goals

We run Tobit regressions to study the proportion of awards that is assigned to pre-specified performance goals (i.e., performance-based awards).[71] We find that firms with complex activities and large growth opportunities tend to tie a lower

[70] Some past studies have excluded firms in the Utilities industry (32 observations in our sample) and financial firms (95 observations in our sample). The rationale behind excluding the Utilities industry was that these firms are regulated and thus would have different constraints on compensation. Since in our sample period most firms in the Utilities industry are no longer regulated, we do not consider this a concern. Financial firms have been excluded in some previous studies because they tend to have different compensation packages than other industries. We already control for these differences by including sector dummies. In addition, we run subsample analyses that exclude the financial firms. Except for the regressions displayed in Table 10 with the performance horizon as the dependent variable, in which the coefficient of blockholder ownership is no longer significant, all the other results hold and in many cases are even strengthened. We also run another subsample analysis with only financial firms. Even though we have a small sample size, most of the results hold (some coefficients are less significant but the signs remain unchanged). Therefore, we believe that including the financial firms does not create any bias in our results compared to previous studies.

[71] To compare with results in Section 2.6 –Table 2.10, in all our regressions in Table 2.5, 2.6 and 2.8 we drop sample firms with missing observations for the main governance characteristics (i.e.,

portion of CEO awards to pre-specified performance goals. This is consistent with the incomplete contracting hypothesis: it is more costly to pre-specify performance terms for firms with complex activities and less stable strategy; thus, these firms tend to use more discretion in rewarding CEOs. In addition, firms where the CEO has longer tenure tend to grant a larger fraction of the awards as performance-based awards. CEO tenure is an additional proxy for the stability of a firm's strategy and thus we find that firms with more stable strategies tend to rely more on pre-specified performance goals, which is also consistent with the incomplete contracting hypothesis. Furthermore, we observe that sector dummies have significant explanatory power, suggesting that business environment matters a great deal to the decision between explicit and discretionary awards.

However, some discretionary awards (stock and options time-vesting awards) are in essence performance-based because their value increases if price increases even though the number of shares is fixed. To check the robustness of our results, we define discretionary bonus as the only discretionary award. We use two different dependant variables: the ratio of discretionary bonus to total awards and the ratio of discretionary bonus to the sum of bonus and non-equity awards. Our results are consistent with those in Table 5: complex and growth firms tend to use more discretionary rewards.

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blockholder ownership and CEO Chairman dummy). The results do not change if we keep all sample firms.

Table 2.5. Performance-based Awards

Table 2.5 shows results of Tobit regressions (left censored at 0 and right censored at 1) with the ratio of the value of performance-based awards to total awards as the dependent variable. The independent variables are defined in Table 2.4. The constant term is included but not reported. Robust standard errors are reported in parentheses. The symbol *** indicates that the p-value is less than 0.01, ** that it is less than 0.05, and * that it is less than 0.1.

	Tobit Regressions		
	(1)	(2)	(3)
VARIABLES	Perf/Total	Perf/Total	Perf/Total
Log Assets	-0.0323**	-0.0137	-0.0173
	(0.0130)	(0.0142)	(0.0152)
# Business Segments			0.00966
			(0.00942)
Investment / A	-1.170***	-1.557***	-1.652***
	(0.328)	(0.385)	(0.384)
Q(ind)			-0.0434
			(0.0390)
Log Firm Age	0.0143	0.0179	0.0179
	(0.0179)	(0.0178)	(0.0174)
Log CEO Tenure			0.0442*
			(0.0250)
Sector Dummies	No	Yes	Yes
Observations	457	457	452
Pseudo R-squared	0.0344	0.103	0.122

2.5.2 Market and Accounting Performance Measures

We run Tobit regressions to study the proportions of performance-based awards tied to different performance measures. We focus on accounting-based and market-based performance measures because they are the most commonly used performance measures. The fraction assigned to non-financial performance measures is simply equal to one minus the sum of fractions assigned to

accounting and market measures; thus, it is relatively easy to infer the results for non-financial measures.

The choice of performance measures is mainly driven by the nature of a firm's activities. Large firms and firms with multiple business segments tend to tie a larger fraction of the performance-based awards to market measures rather than accounting measures. In addition, young firms and firms with large growth opportunities tend also to tie a larger fraction of the performance-based awards to market measures rather than accounting measures. Furthermore, business environment matters. We observe that sector dummies have significant explanatory power. All these results are consistent with the informativeness hypothesis. Finally, we find that CEOs with longer tenure tend to receive performance-based awards tied to accounting measures rather than market measures. We do not have a clear prediction concerning CEO tenure. However, since CEO tenure might measure the stability of a firm's strategy and because mature firms tend to have more stable strategies, this result is also in line with predictions from optimal contracting theories.[72]

[72] We note that CEO shareholdings might play a role in choice of market versus accounting performance evaluation. For instance, a firm with a CEO with large shareholdings might be less inclined to assign a large fraction of the awards to market-based performance since the CEO already has a lot of incentives to increase the stock price (versus accounting performance). Due to the collinearity issue, we do not include CEO shareholdings and CEO tenure in the same regression (their correlation coefficient is close to 0.5). We substitute CEO tenure with CEO shareholdings in the regressions of Table 2.6 and find that the coefficient for CEO shareholdings is not significant. The results might indicate that, within our sample of large firms, CEO holdings do not seem to play a significant role in the choice of performance measure.

Table 2.6. Weights of Market and Accounting Performance Measure

Table 2.6 shows results of Tobit regressions (left censored at 0 and right censored at 1). The dependent variables are the proportions of the value of performance-based awards assigned to market and accounting performance measures. The independent variables are defined in Table 2.4. The constant term is included but not reported. Robust standard errors are reported in parentheses. The symbol *** indicates that the p-value is less than 0.01, ** that it is less than 0.05, and * that it is less than 0.1.

	Tobit Regressions					
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Prop.Mkt	Prop.Mkt	Prop.Mkt	Prop.Acct	Prop.Acct	Prop.Acct
Log Assets	0.135***	0.102***	0.0813***	-0.0813***	-0.0521***	-0.0442**
	(0.0266)	(0.0285)	(0.0288)	(0.0173)	(0.0183)	(0.0185)
# Business Segments			0.0305			-0.0122
			(0.0199)			(0.0115)
Investment / A	1.454*	0.471	0.778	-1.223***	-0.677	-0.888*
	(0.806)	(0.896)	(0.892)	(0.459)	(0.472)	(0.491)
Q(ind)			0.0183			-0.00285
			(0.0988)			(0.0524)
Log Firm Age	-0.0516	-0.0396	-0.0389	0.0473**	0.0325	0.0308
	(0.0393)	(0.0359)	(0.0359)	(0.0223)	(0.0211)	(0.0213)
Log CEO Tenure			-0.0695			0.0739**
			(0.0536)			(0.0325)
Sector Dummies	No	Yes	Yes	No	Yes	Yes
Observations	420	420	416	420	420	416
Pseudo R-squared	0.0386	0.139	0.146	0.0444	0.148	0.161

2.5.3 Sales, Income, and Accounting Returns Performance Measures

Our next step is to study the proportions of performance-based awards tied to the various performance measures among accounting performance measures. Because they are the measures most commonly used, we focus on income measures, sales, and accounting returns performance measures.

Table 2.7 shows the results. We find that firms that have high investment activities and large growth opportunities tend to tie a larger portion of CEO

compensation to sales performance measures, consistent with the interpretation that these firms are more concerned with establishing market share than with making large profits in the short run. In contrast, firms that have a low level of investments and few growth opportunities tend to tie a larger portion of CEO compensation to income and accounting returns performance measures. We also observe that firms rely more on accounting performance measures when they are more mature and have fewer growth opportunities, which is consistent with a firm's life cycle argument. We also observe that firms in similar sectors tend to adopt similar accounting performance measures, especially for sales-based measures. We find less significant results for the income measures. One potential reason for the lack of significance is that we have little variability in this measure - most firms in our sample that rely on accounting measures use income-based performance measures. The popularity of this measures is possibly linked to the fact that analysts and the financial press rely heavily on these measures to evaluate firms. This potential popularity might play a role in the choice of this measure.

Table 2.7. The Choice across Accounting Performance Measures

Table 2.7 shows results of Tobit regressions (left censored at 0 and right censored at 1). The dependent variables are the proportions of the performance-based awards assigned to sales, income, and accounting returns performance measures among accounting performance measures. The independent variables are defined in Table 2.4. The constant term is included but not reported. Robust standard errors are reported in parentheses. The symbol *** indicates that the p-value is less than 0.01, ** that it is less than 0.05, and * that it is less than 0.1.

	Tobit Regressions								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
VARIABLES	P. Sales	P. Sales	P. Sales	P. Income	P. Income	P. Income	P. Acct R.	P. Acct R.	P. Acct R.
Log Assets	-0.0192	-0.00545	0.0167	-0.0713***	-0.0781***	-0.0719***	0.114***	0.122***	0.114***
	(0.0168)	(0.0179)	(0.0184)	(0.0191)	(0.0208)	(0.0215)	(0.0289)	(0.0314)	(0.0319)
# Bus. Segments			-0.0151			-0.0102			-0.0112
			(0.0109)			(0.0155)			(0.0202)
Investment / A	1.587***	0.891*	0.821*	-1.042*	-1.215*	-1.280*	-1.494*	-0.860	-0.636
	(0.393)	(0.482)	(0.464)	(0.549)	(0.665)	(0.677)	(0.837)	(1.022)	(1.014)
Q(ind)			0.163***			0.0192			-0.265***
			(0.0447)			(0.0579)			(0.0793)
Log Firm Age	0.000290	0.00502	0.00473	-0.0321	-0.0103	-0.00508	0.0984**	0.0411	0.0418
	(0.0210)	(0.0215)	(0.0218)	(0.0255)	(0.0254)	(0.0256)	(0.0404)	(0.0375)	(0.0372)
Log CEO Tenure			0.00582			-0.00482			-0.00541
			(0.0292)			(0.0407)			(0.0514)
Sector Dummies	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Observations	432	432	428	432	432	428	432	432	428
Pseudo R-squared	0.0423	0.183	0.218	0.0215	0.0692	0.0687	0.0497	0.136	0.154

2.5.4 Performance Horizon

We run OLS regressions with the value-weighted performance horizon as a dependent variable. Table 2.8 shows the results. The table shows that, overall, there is a weak relation between performance horizon and firm characteristics, and the signs of the coefficients are not consistent across the specifications. Firm size is positively related to performance horizon and it is statistically significant. However, number of business segments is negatively related to performance horizon and is not significant.

Table 2.8. Performance Horizon

Table 2.8 shows results of three OLS regressions. The dependent variables are the value weighted contract length of performance-based awards (Perf H). The independent variables are defined in Table 2.4. The constant term is included in the regression but not reported. Robust standard errors are reported in parentheses. The symbol *** indicates that the p-value is less than 0.01, ** that it is less than 0.05, and * that it is less than 0.1.

	OLS		
	(1)	(2)	(3)
VARIABLES	Perf H.	Perf H.	Perf H.
Log Assets	0.167***	0.167***	0.132***
	(0.0382)	(0.0446)	(0.0430)
# Business Segments			-0.00986
			(0.0239)
Investment / A	0.394	0.397	0.515
	(1.176)	(1.236)	(1.214)
Q(ind)			-0.160*
			(0.0962)
Log Firm Age	-0.00285	-0.0145	-0.0194
	(0.0499)	(0.0533)	(0.0537)
Log CEO Tenure			0.00370
			(0.0684)
Sector Dummies	No	Yes	Yes
Observations	420	420	416
R-squared	0.049	0.060	0.056

We find that the coefficients of growth opportunities (investment/assets) and firm maturity (firm age) have signs that are consistent with our predictions. CEOs in firms that have higher growth opportunities tend to have contracts with longer horizons. However, none of these coefficients is statistically significant. In addition, we do not find that Q(ind) is positively related to performance horizon (column 3). In fact, it is significantly negative at the 10% level. However, this significant relation disappears once we add governance variables to the regression (next section).

Furthermore, we do not find that performance horizon is significantly clustered by sector, since the goodness-of-fit measure is not improved when we add the sector dummies. We conjecture that the lack of significance is related to the fact that most firms choose similar vesting periods for their CEOs.

2.5.5 Robustness tests - Contract Design and Compensation Consultant Identity

It is possible that our results are influenced by the identity of the compensation consultants. Some compensation consultants might have specific "tastes" in designing CEO contracts and thus influence the contractual terms. In that case the choices of performance measures might be suboptimal. To examine this potential effect, we add dummy variables to the regression, one for each of the most hired

compensation consultants in our sample.[73] In untabulated results, we find no relation between the identity of the compensation consultant and any of the performance choices.[74] Moreover, the addition of these dummy variables does not alter the results concerning the economic determinants.

2.5.6 Robustness tests - Reliability of the Data

A concern regarding the data is that firms do not necessarily disclose the right information regarding their compensation contracts. Past studies have shown that disclosed terms of CEO compensation can be manipulated, and we acknowledge that it is possible that firms have manipulated the disclosure of the terms used here.[75] It is also possible that firms rig performance measures after the fact (Morse et al. 2011), and the disclosed measures are simply an ad hoc justification for high compensation to the CEO. While we cannot completely dismiss this interpretation, we try to address these concerns with several tests, as we discuss below.

2.5.6.1 Persistence of the Choice of Performance Measures

First, we examine the extent to which the choice of performance measures is persistent. If firms are rigging measures after the fact, then we should see fluctuation in the use of performance measures over time.

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[73] In our sample, we find that 18.02% firms employ Frederick W. Cook & Co., 17.81% Towers Perrin, 13.77% Mercer, 12.55% Hewitt, 7.89% Watson Wyatt & Co., 5.06% Pearl Meyer & Partners, and 3.24% Semler Brossy.

[74] The results are not reported but are available upon request.

[75] For example, Lie (2005) has shown that firms falsified the grant dates of options grants in the backdating scandal. (See also Yermack, 1997, and Bebchuk, Grinstein, and Peyers, 2010).

We randomly choose 30 firms that granted non-equity awards in 2006 and compare the choice of performance measures in 2006 and 2007. Among them, 25 firms used the exact same set of performance measures for the non-equity awards in 2006 and 2007, 4 firms modified the set, and 1 firm completely changed the performance measures used. The firm that changed the set of performance measures had a new CEO in 2007. In comparison, four firms retained the same CEO in 2006 and 2007 but, on average, slightly modified the set of performance measures.[76] For instance, one firm had only earnings per share (EPS) in 2006 and added two measures in 2007—free-cash flow and revenue—but assigned a 50% weight to EPS in 2007, thus keeping EPS as the major performance measure. In this subsample analysis, we find that a large majority of firms keep the same set of performance measures. These results indicate that, while some flucatuations in performance measures exist, the choice of performance measures is quite persistent.

2.5.6.2 *Modification of performance goals in multi-year awards*

We check and validate that the terms of multi-year awards are not changed over the years. This means that firms do not assign ad hoc performance goals after the fact but keep the original goals over the term of the award. We randomly choose 30 firms that granted equity awards in 2007 with a 3-year performance horizon and examine whether in the 3 subsequent years (fiscal 2008, fiscal 2009, 2010

[76] Among the 4 firms, 2 added one performance measure in 2007, and 2 firms added 2 measures in 2007 to the ones they used in 2006. For these 4 firms, we check if these choices were persistent

proxy) the firm does not change the performance goal. In all cases, the performance goals remain the same.

2.5.6.3 *Pay-Performance Sensitivity, Incorporating the Newly Disclosed Contractual Terms*

Our last test examines whether the new information from the proxy statements regarding the reliance on market and accounting performance goals helps explain cross-sectional variation in CEO compensation realization. If the disclosed terms are incorrect, then the realization of the CEO compensation will not be related to these terms.

We run a regression where CEO compensation is explained by firms' economic and performance variables. Our regression specification is based on Aggarwal and Samwick (1999) and Rajgopal, Shevlin, and Zamora, (2006). We define CEO total direct compensation (TDC) as the dependent variable, dollars returns (total shareholder returns (TSR) multiplied by market capitalization at the beginning of the year) as the firm's market performance, and net income as the firm's accounting performance.[77] We add to the independent variables explanatory variables for the terms of the contracts. We use the proportion of performance-based awards tied to market measures multiplied by the firm stock-performance realization to capture the proportion of the contract tied to market-based performance and the proportion tied to accounting measures multiplied by the

for 2008: 2 firms had the same set of performance measure for 2007 and 2008, one firm added a new measure in 2008, and one firm substituted a measure (but this last firm had a new CEO).

earnings performance to capture the extent to which the contract relies on accounting-based performance. The coefficients are estimated via median regressions.[78] We control for firm size, year fixed-effects, and sector fixed-effects, and study 3 years of compensation and performance.[79] The results suggest that the contractual terms are very informative.. We find that when firms declare that they tie a larger proportion of their performance-based awards to market performance, the sensitivity of compensation to market performance is significantly higher. The results are even more striking with respet to accounting performance. Without the use of the new information disclosed under the 2006 SEC requirements, we do not obverse significant pay-for-accounting performance. However, once we interact the accounting performance with the proportion of performance-based awards tied to accounting measures, the coefficient becomes statistically and economically significant. These conclusions do not change when we study both types of performance at the same time. Therefore, our results indicate that firms that assign larger weights on market (accounting) performance have greater pay for market (accounting) performance sensitivity.

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[77] We winsorize TSR at 5% in the Compustat database.

[78] Median regressions are also used in Aggarwal and Samwick (1999) and Rajgopal, Shevlin, and Zamora (2006). See, for instance, Koenker and Hallock (2001) for an explanation of Median regressions. Compared to ordinary least squares regressions, median regressions are less influenced and more robust to the presence of large outliers, since they are based on the median as the measure of the distribution's center instead of the mean. Large outliers and skewness of the data are important issues in compensation regression; for instance, in our sample (in 2007) the values of TDC vary from 0 to 75 million dollars, and its mean is about 10 million dollars. Due to this issue, median regressions give us more precise estimates.

[79] In our regressions, we drop the observations for which TDC is equal to zero (21 observations). Conclusions remain unchanged if we keep these observations.

Table 2.9. Pay-for-Performance Sensitivity Taking into Account the New Information

Table 2.9 shows results of median regressions for a sample of S&P 500 firms with CEO unchanged from previous year (2006-2007 and 2007-2008). The sample covers the year 2006 to 2008. The dependent variable is CEO total direct compensation (TDC). Market capitalization is the number of shares outstanding multiplied by the firm's stock price. Market performance is defined as dollar return to shareholders (i.e., total shareholder returns (TSR) multiplied by market capitalization at the beginning of the year). Accounting performance is defined as the firm's net income. The value of TDC is in thousands of dollars while market capitalization, market and accounting performance are in millions of dollars. Market Weight and Accounting Weight are the proportions of the value of performance-based awards assigned to market and accounting performance measures in the 2007 contract. The constant term, year fixed effects, and sector dummies are included but not reported. Bootstrapped standard errors based on 20 replications are reported in parentheses. The symbol *** indicates that the p-value is less than 0.01, ** that it is less than 0.05, and * that it is less than 0.1.

	Median Regressions					
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	TDC	TDC	TDC	TDC	TDC	TDC
Market Cap (t-1)	0.0970***	0.0959***	0.0826***	0.0405**	0.0934***	0.0721***
	(0.0117)	(0.0107)	(0.0134)	(0.1744)	(0.0124)	(0.0249)
Market Perf.	0.110**	0.0358			0.106**	0.0537
	(0.0442)	(0.0444)			(0.0447)	(0.0463)
Market Weight * Market Perf.		0.201***				0.142**
		(0.0708)				(0.0715)
Accounting Perf.			0.0940	0.0746	0.0582	-0.211
			(0.115)	(0.2699)	(0.0606)	(0.313)
Accounting Weight * Accounting Perf.				1.010***		0.793**
				(0.3502)		(0.370)
Observations	1269	1269	1269	1269	1269	1269
Pseudo R-squared	0.130	0.135	0.125	0.135	0.131	0.142

Hence, we find strong evidence that the contractual terms of CEO compensation (i.e., the choice of performance measures) are indeed informative.

In light of these results, we conclude that the choice of performance measure is persistent, binding and, indeed, informative.

2.6. Deviations from Optimal Contracting

In this subsection, we investigate potential deviations from optimal contracting by assessing whether measures of CEO power influence the design of the contract. A recent argument regarding the design of compensation contracts is that CEOs often have the power to influence who will sit on the boards, and the directors often feel obligated to the CEOs and are afraid to challenge them, especially when it comes to compensation decisions (e.g., Bebchuk and Fried, 2003, 2004). According to these arguments, when the CEOs have more power to affect their compensation decisions, they will choose not to base their compensation on explicit-performance measures, but rather will choose outcomes ex-post to rationalize their large compensation. To the extent that powerful managers have some explicit-performance measures in the compensation contracts, they will choose performance measures that are easier to manipulate, such as accounting measures or short-horizon measures.

To test this argument, we include governance characteristics in our cross-sectional analysis to examine whether governance has an effect on the structure of the compensation contract.[80] The results are reported in Table 2.10.

We use three different measures to capture CEO power: the proportion of ownership by shareholders who own more than 5% of the shares outstanding (shareholder monitoring, Bertrand and Mullainathan, 2000, 2001), an indicator variable for CEO Chairman (board leadership), and the E-index (anti-takeover protection, Bebchuk, Cohen, and Ferrell, 2009).

Panel A shows a potential relation between the strength of corporate governance mechanisms and the reliance on discretionary awards. We find a significant positive relation between concentration of holdings by shareholders and the proportion of awards based on explicit-performance measures. In addition, the coefficient for CEO Chairman is negative (but not significant), which is also consistent with the CEO power hypothesis. In contrast, the coefficient for the E-index is positive and not significant, a result inconsistent with the CEO power hypothesis.

While weaker governance is associated with more reliance on discretionary awards, it does not seem to affect the choice between performance measures in the pre-specified portion of compensation. Panel A also shows that CEO power

[80] Since we do not have a clear prediction on the relation between CEO power and the use of the different accounting measures, we do not study the relation between the choice of the different accounting measures and governance characteristics.

does not influence firm choice between accounting- and market-based awards. This portion of the award, which is based on pre-specified goals, is not affected.

Finally, we find a significant positive relation between concentration of holdings by shareholders and performance horizon (consistent with the CEO power hypothesis). However, the coefficient for the E index is significant and positive, which is not consistent with the CEO power hypothesis. [81] The coefficient for CEO Chairman is positive as well.

Overall, the results suggest potential relations between weaker governance and heavier reliance on discretionary awards and the performance horizon of the pre-specified awards. However, the only significant coefficient is that of the concentration of ownership by shareholders. None of the other governance variables has a significant effect, and the sign of the E-index coefficient is inconsistent with the CEO power hypothesis..

To further explore the effect of concentration of ownership on deviation from optimal contracting, we examine whether concentration of holdings alters the economic relations that we find in the previous section. We test whether the fundamental relations between compensation structure and firm size, complexity, and maturity change if we have low concentration of ownership. To that end, we split our sample into two equal subsamples, based on the level of

[81] We obtain similar results if we use the G index (i.e., the governance index proposed by Gompers, Ishii, and Metrick (2003), which is based on 24 antitakeover provisions that are equally weighted) instead of the E index, except that the coefficient for the G index is not significant at 10% in the performance horizon regression.

shareholder ownership concentration. We then run the original specifications on each of the subsamples and compare the coefficients of the economic variables across the two subsamples. We present the results in Panel B of Table 2.10.

Overall, we cannot reject the similarity of the coefficients across the different subsamples. These findings suggest that the ownership structure does not alter the fundamental relation between size, complexity, growth, maturity, and compensation structure.

One potential reason for the weak evidence of the relation between contract structure and governance is that firms that need to disclose the contract will hide their agenda by showing a contract that is sound economically. In that case, firms might compensate the manager sub-optimally with the discretionary portion of the compensation. Since the reasons behind discretionary payments lack transparency, it is difficult to make conclusions about the appropriateness of these payments. This portion of CEO compensation remains the gray area in our analysis. On the one hand, we find consistent results with the rent extraction argument: CEOs who are less monitored receive a larger portion of their compensation via discretionary awards. On the other hand, according to the incomplete contracting hypothesis, there are economic rationales concerning the use of discretion, and we find results consistent with this hypothesis: complex firms use more discretionary rewards.

Table 2.10. Contract Design and Corporate Governance

Table 2.10 shows results of Tobit regressions (left censored at 0 and right censored at 1) and OLS regressions. The dependent variables are the ratio of the value of performance-based awards to total awards (Perf/Total), the proportions of the value of performance-based awards assigned to market and accounting performance measures (Prop. Mkt and Prop. Acct, respectively), and the value weighted contract length of performance-based awards (Perf H). The independent variables are defined in Table 2.4. In Panel B, we provide subsample results. Firms are sorted by the proportion of ownership by shareholders who own more than 5% of the shares outstanding: we classify firms into two groups, low (first half of the distribution) and high (second half of the distribution) blockholder ownership. The constant term is included in the regression but not reported. Robust standard errors are reported in parentheses. The symbol *** indicates that the p-value is less than 0.01, ** that it is less than 0.05, and * that it is less than 0.1.

	Panel A							
	Tobit	Tobit	Tobit	Tobit	Tobit	Tobit	OLS	OLS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	Perf/Total	Perf/Total	Prop.Mkt	Prop.Mkt	Prop.Acct	Prop.Acct	Perf H.	Perf H.
Log Assets	-0.00902	-0.00662	0.0822***	0.0926***	-0.0457**	-0.0507**	0.140***	0.179***
	(0.0152)	(0.0167)	(0.0289)	(0.0305)	(0.0193)	(0.0202)	(0.0412)	(0.0417)
# Bus. Segments	0.0109	0.00876	0.0320	0.0299	-0.0129	-0.0123	-0.00577	-0.00343
	(0.00934)	(0.00946)	(0.0197)	(0.0191)	(0.0115)	(0.0118)	(0.0240)	(0.0240)
Investment / A	-1.695***	-1.670***	0.793	0.639	-0.886*	-0.721	0.503	0.699
	(0.381)	(0.390)	(0.893)	(0.870)	(0.496)	(0.508)	(1.215)	(1.293)
Q(ind)	-0.0319	-0.0187	0.0346	0.0376	-0.00901	-0.0102	-0.127	-0.111
	(0.0389)	(0.0395)	(0.101)	(0.0981)	(0.0529)	(0.0535)	(0.0932)	(0.0940)
Log Firm Age	0.0223	0.0116	-0.0408	-0.0604*	0.0310	0.0413*	-0.0227	-0.0423
	(0.0175)	(0.0181)	(0.0367)	(0.0365)	(0.0217)	(0.0227)	(0.0547)	(0.0577)
Log CEO Tenure	0.0475	0.0529*	-0.109*	-0.0767	0.0842**	0.0709*	-0.0475	0.00623
	(0.0290)	(0.0303)	(0.0617)	(0.0615)	(0.0364)	(0.0379)	(0.0803)	(0.0848)
Governance Characteristics:								
Prop. Ownership By 5% Block	0.288***	0.286**	0.413	0.413	-0.158	-0.194	0.791**	0.889**
	(0.106)	(0.115)	(0.258)	(0.256)	(0.144)	(0.147)	(0.368)	(0.380)
CEO Chairman	-0.00839	-0.0173	0.137	0.123	-0.0365	-0.0422	0.182	0.126
	(0.0418)	(0.0437)	(0.0884)	(0.0900)	(0.0517)	(0.0547)	(0.128)	(0.135)
E index		0.00695		0.0247		0.00220		0.0676*
		(0.0143)		(0.0296)		(0.0182)		(0.0351)
Sector Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	452	432	416	400	416	400	416	400
R-squared							0.074	0.095
Pseudo R^2	0.134	0.125	0.156	0.164	0.164	0.154		

Table 2.10. Continued

	Panel B							
VARIABLES	Tobit Perf/Total	Tobit Perf/Total	Tobit Prop.Mkt	Tobit Prop.Mkt	Tobit Prop.Acct	Tobit Prop.Acct	OLS Perf H.	OLS Perf H.
Subsample sorted by	Prop. Ownership By 5% Blockholder		Prop. Ownership By 5% Blockholder		Prop. Ownership By 5% Blockholder		Prop. Ownership By 5% Blockholder	
	Low (1^{st} Half)	High (2^{nd} Half)	Low (1^{st} Half)	High (2^{nd} Half)	Low (1^{st} Half)	High (2^{nd} Half)	Low (1^{st} Half)	High (2^{nd} Half)
Log Assets	-0.00533	-0.0193	0.124***	0.0195	-0.0579**	-0.00764	0.166***	0.148*
	(0.0187)	(0.0258)	(0.0437)	(0.0442)	(0.0246)	(0.0317)	(0.0464)	(0.0801)
# Bus. Segments	-0.000592	0.0205	0.0234	0.0191	0.0117	-0.0251	0.0110	-0.0373
	(0.0138)	(0.0141)	(0.0332)	(0.0263)	(0.0199)	(0.0155)	(0.0382)	(0.0360)
Investment / A	-1.936***	-1.648***	-0.430	1.155	-0.454	-0.924	1.960	-0.814
	(0.517)	(0.542)	(1.461)	(1.030)	(0.736)	(0.613)	(2.698)	(1.179)
Q(ind)	-0.0597	-0.0114	-0.259	0.139	0.157*	-0.0817	-0.227*	-0.0846
	(0.0596)	(0.0540)	(0.168)	(0.123)	(0.0848)	(0.0666)	(0.131)	(0.136)
Log Firm Age	0.0401*	-0.00202	0.00199	-0.0586	-0.00542	0.0608**	0.0510	-0.0217
	(0.0221)	(0.0265)	(0.0554)	(0.0432)	(0.0297)	(0.0278)	(0.0615)	(0.0825)
Log CEO Tenure	0.0755**	0.0143	-0.0209	-0.0899	0.0336	0.101**	-0.00466	0.0173
	(0.0311)	(0.0407)	(0.0788)	(0.0706)	(0.0460)	(0.0440)	(0.0885)	(0.108)
Sector Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	220	232	201	215	201	215	201	215
R-squared							0.117	0.096
Pseudo R^2	0.215	0.106	0.174	0.201	0.199	0.198		

Table 2.11. Discretionary Awards and Firm (Past, Present, and Future) Performance

Table 2.11 shows results of median regressions for a sample of S&P 500 firms with CEO unchanged from the previous year. The dependent variable is the discretionary awards granted to the CEO in 2007. Market capitalization is the number of shares outstanding multiplied by the firm stock price. Market performance is defined as dollar return to shareholders (i.e., total shareholder returns (TSR) multiplied by market capitalization at the beginning of the year). Accounting performance is defined as the firm's net income. The value of discretionary wards is in thousands of dollars while market capitalization, market and accounting performance are in millions of dollars. Market Weight and Accounting Weight are the proportions of the value of performance-based awards assigned to market and accounting performance measures in the 2007 contract. Past performance is defined as 2006 performance (Panel A). Present performance is defined as 2007 performance (Panel B). Future performance is defined as 2008 performance (Panel C). The constant term and sector dummies are included but not reported. Bootstrapped standard errors based on 20 replications are reported in parentheses. The symbol *** indicates that the p-value is less than 0.01, ** that it is less than 0.05, and * that it is less than 0.1.

Panel A: Discretionary Awards and Firm Past Performance

	Median Regressions					
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Discretionary Awards	Discretionary Awards	Discretionary Awards	Discretionary Awards	Discretionary Awards	Discretionary Awards
Market Cap (t-1)	0.0367***	0.0397**	0.0328	0.0350	0.0285	0.0218
	(0.0102)	(0.0193)	(0.0347)	(0.0249)	(0.0244)	(0.0259)
Market Perf.	0.0299	0.0341			0.0309	0.0460
	(0.0428)	(0.0704)			(0.0371)	(0.0632)
Market Weight * Market Perf.		-0.244				-0.208
		(0.298)				(0.501)
Accounting Perf.			0.108	-0.00454	0.117	0.0724
			(0.408)	(0.575)	(0.365)	(0.752)
Accounting Weight * Accounting Perf.				0.212		0.251
				(0.667)		(0.881)
Observations	395	395	395	395	395	395
Pseudo R-squared	0.1164	0.1209	0.1155	0.1170	0.1171	0.1227

Table 2.11. Continued

Panel B: Discretionary Awards and Firm Present Performance -- Median Regressions						
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Dis. Awards	Dis. Awards	Dis. Awards	Dis. Awards	Dis. Awards	Dis. Awards
Market Cap (t-1)	0.0420***	0.0374***	0.0447***	0.0519***	0.0460***	0.0458**
	(0.00652)	(0.00772)	(0.0156)	(0.0185)	(0.0177)	(0.0219)
Market Perf.	-0.0349	-0.0164			-0.0317	-0.0225
	(0.0233)	(0.0197)			(0.0307)	(0.0226)
Market Weight * Market Perf.		-0.0983				-0.0542
		(0.177)				(0.119)
Accounting Perf.			-0.0659	-0.196	-0.0502	-0.0758
			(0.238)	(0.440)	(0.221)	(0.363)
Accounting Weight * Accounting Perf.				0.171		0.0474
				(0.527)		(0.309)
Observations	400	400	400	400	400	400
Pseudo R-squared	0.1213	0.1237	0.1130	0.1176	0.1223	0.1254
Panel C: Discretionary Awards and Firm Future Performance -- Median Regressions						
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Dis. Awards	Dis. Awards	Dis. Awards	Dis. Awards	Dis. Awards	Dis. Awards
Market Cap (t-1)	0.0299**	0.0277*	0.0438***	0.0452***	0.0415*	0.0387**
	(0.0116)	(0.0142)	(0.00793)	(0.00718)	(0.0232)	(0.0162)
Market Perf.	-0.0290	-0.0431			-0.00950	-0.0240
	(0.0271)	(0.0324)			(0.0458)	(0.0357)
Market Weight * Market Perf.		0.0507				0.0397
		(0.101)				(0.0824)
Accounting Perf.			-0.0856	-0.106	-0.0819	-0.0794
			(0.0620)	(0.255)	(0.0789)	(0.253)
Accounting Weight * Accounting Perf.				0.148		0.140
				(0.286)		(0.355)
Observations	395	395	395	395	395	395
Pseudo R-squared	0.1136	0.1165	0.1162	0.1243	0.1170	0.1274

So we further investigate the link between discretionary awards and firm performance. We analyze the pay-for-performance sensitivity in the discretionary portion of CEO compensation. The results are reported in Table 2.11. We use similar specifications to those in Section 4.6 (see Table 2.9). We define market performance as dollar returns to shareholders and accounting performance as net income. We use past performance (fiscal 2006—Panel A) and present performance (fiscal 2007—Panel B) because some discretionary awards are granted at the beginning and at the end of fiscal 2007. The dependent variable is the value of the discretionary awards granted to the CEO in 2007. We use median regression and control for firm size (at the beginning of fiscal 2007) and sector dummies. We find that neither market nor accounting performance significantly explain the level of discretionary awards.

While no pay-for-past-performance could indicate sub-optimality of the contract, it is also possible that the board pays the CEO for actions that are not easily observable or cannot be easily contracted. If this is the case, then to the extent that these actions maximize value, we should observe a correlation between the non-discretionary awards and future firm value. We therefore study whether there is some relation between discretionary awards and future performance (Panel C). We do not find any significant relation.[82]

These results cast doubt on the optimality of these awards and call for further research to understand the reasons for awarding discretionary awards. Based on our analysis thus far, we find mixed evidence on the relation between compensation and governance. Measures

[82] Another possibility is that discretionary awards are not given for performance at all. For example, Oyer (2004) shows that some awards are given for retention purposes. However, even when awards are given for retention purposes, it is likely that they will be given when the outside options of the CEO are high - correlated with the performance of the stock (Himmelberg and Hubbard 2000).

that we use for weak governance are not significantly related to the choice of performance measures; only ownership concentration is related to the fraction of discretionary awards and performance horizon; and ownership structure does not alter the fundamental relation between complexity, growth, maturity, and compensation structure. We interpret these results as weak evidence of deviation from optimal contracting.

2.7. Conclusion

The new disclosure requirements introduced in December 2006 by the SEC enable us to observe how boards link CEO awards to performance. Our evidence suggests that firms base the majority of the awards on explicit and pre-specified performance measures. Furthermore, we find significant variations in the use of performance measures. On average, firms rely mostly on accounting-based performance measures, among which they put heavier weights on income measures, sales, and accounting returns. Our findings are in line with predictions from optimal contracting theories: firms with complex activities and large growth opportunities tend to rely less on explicit-performance measures and tend to tie a larger fraction of the award to market-based measures rather than to accounting-based measures. Large firms tend to use long-term performance horizon. Growth firms tend to rely on sales measures among accounting measures, whereas mature firms tend to rely more on accounting returns. CEOs with long tenure, a measure of the stability of firm strategy, tend to receive a larger fraction of awards tied to explicit-performance measures and a larger fraction of performance-based awards tied to accounting-based measures.

We do not find that governance mechanisms distort the choice of performance measures in the CEO contract. All the measures that we use for weak governance are not significantly

related to the choice of measures. We find some evidence that the discretionary portion of the compensation is larger and performance horizon is shorter when shareholder monitoring is weaker, but only when measured by the proportion of ownership by 5% blockholder. We interpret these results as weak evidence of deviation from optimal contracting. Further investigation of the discretionary portion of compensation is a fruitful area for future research.

Appendix 2.A. Evolution of compensation disclosure: 2005-2007

In this appendix we examine the level of disclosure of the different components of CEO compensation for a sample of 87 firms that belong to the S&P 500. We examine the proxy statements of fiscal 2005 (a year before the rule), fiscal 2006 (immediately after the rule) and fiscal 2007 (after the rule).

Disclosure Evolution						
	2005 (N=87)		2006 (N=87)		2007 (N=87)	
Items	Nbr of Firms	Proportion	Nbr of Firms	Proportion	Nbr of Firms	Proportion
Information about consulting service and peer group:						
Firm employs an external consulting firm and its name is reported	17	20%	66	76%	79	91%
Use of a peer group	73	84%	81	93%	86	99%
Information about benchmarking:						
Total direct compensation benchmarked against a peer group	14	16%	14	16%	22	25%
Base salary is targeted as a certain proportion of total direct compensation	2	2%	26	30%	28	32%
Base salary benchmarked against a peer group	19	22%	22	25%	29	33%
Details of performance based non equity awards and cash bonus:						
Disclosure of performance threshold	8	9%	33	38%	54	62%
Disclosure of payoff conditional on performance	13	15%	63	72%	73	84%
Details of performance based stock awards:						
Disclosure of performance threshold	9	10%	36	41%	38	44%
Disclosure of payoff conditional on performance	28	32%	45	52%	48	55%
Details of non-performance based stock awards:						
Disclosure of vesting schedule	40	46%	40	46%	43	49%
Details of performance based stock-option awards:						
Disclosure of performance threshold	0	0%	3	3%	0	0%
Disclosure of payoff conditional on performance	0	0%	4	5%	0	0%
Details of non-performance based stock-option awards:						
Disclosure of vesting schedule and pricing method	68	78%	68	78%	67	77%

Appendix 2.B. Illustration of our Data Collection Methodology

In this appendix, we illustrate our data collection methodology using the 2008 Proxy Statement (for fiscal 2007) of the IBM company. We start by looking at the Grants of Plan-Based Awards Table to identify the performance-based and time-vesting awards granted to CEO Palmisano in fiscal year 2007.

2007 Grants of Plan-Based Awards Table

				ESTIMATED FUTURE PAYOUTS UNDER NON-EQUITY INCENTIVE PLAN AWARDS(2)			ESTIMATED FUTURE PAYOUTS UNDER EQUITY INCENTIVE PLAN AWARDS(3)								
NAME (a)	TYPE OF AWARD (1)	GRANT DATE (b)	COMPEN-SATION COMMITTEE APPROVAL DATE	THRESHOLD ($) (c)	TARGET ($) (d)	MAXIMUM ($) (e)	THRESHOLD (#) (f)	TARGET (#) (g)	MAXIMUM (#) (h)	ALL OTHER STOCK AWARDS: NUMBER OF SHARES OF STOCK OR UNITS(4)(5) (#) (i)	ALL OTHER OPTION AWARDS: NUMBER OF SECURITIES UNDER-LYING OPTIONS(6) (#) (j)	EXERCISE OR BASE PRICE OF OPTION AWARDS(7) ($/SH) (k)	CLOSING PRICE ON THE NYSE ON THE DATE OF GRANT ($/SH)	GRANT DATE FAIR VALUE OF STOCK AND OPTION AWARDS(8) ($) (l)
S.J. Palmisano	AIP	N/A	2/27/2007	$ 0	$ 5,000,000	$ 15,000,000								
	PSU	5/8/2007	2/27/2007				18,421	73,685	110,528					$ 7,574,818
	RSU	5/8/2007	2/27/2007							31,579				3,246,321
	SO	5/8/2007	2/27/2007								58,264	$ 102.80	$ 103.29	1,498,550

(1) Type of Award:
AIP = Annual Incentive Plan
RSU = Restricted Stock Unit
SO = Nonqualified Stock Option
PSU = Performance Share Unit
RRSU = Retention Restricted Stock Unit

(2) These amounts will be adjusted based on performance and paid on or before March 15, 2008.
(3) Amounts shown are numbers of PSUs. These awards will be adjusted for performance and be payable on February 1, 2010.
(4) RSUs will vest in three equal annual installments on the first three anniversaries of the grant date.
(5) The RRSU awarded to Mr. Daniels will vest 100% on December 18, 2012.
(6) All of the options shown above will vest 100% on May 8, 2010.
(7) All SOs have an exercise price equal to the average of the high and low prices of IBM stock on the NYSE on the date of grant.
(8) Amounts in this column represent the market value of the full 2007 awards indicated, calculated in accordance with FAS 123R. For option awards, that number is calculated by multiplying the Black-Scholes value by the number of options awarded. For PSUs, RSUs and RRSUs, that number is calculated by multiplying the average high and low prices of IBM stock on the NYSE on the date of grant by the number of units awarded.

In 2007, IBM granted to Mr. Palmisano non-equity and equity performance-based awards: respectively, annual incentive awards (AIP) and performance share awards (PSU). IBM also granted equity time-vesting awards: restricted shares awards (RSU) and nonqualified stock option awards (SO). RSU and SO vest independently of firm performance, and thus according to the SEC definition, RSU and SO are not performance-based awards. In contrast, the amount of AIP and PSU that will be paid to the CEO is conditional on performance; thus, according to the SEC definition, AIP and PSU are performance-based awards. Performance-

based awards are tied to pre-specified performance targets. For these awards, we consider the amount that is likely to be expensed by the company (i.e., the target value for non-equity awards and the fair value for equity awards). Furthermore, the CEO did not receive any discretionary bonus in 2007. Therefore, we can now compute the proportion of value of the CEO awards in 2007 that is tied to pre-specified performance targets:

Proportion of the value of CEO awards tied to pre-specified performance targets (i.e. proportion of performance-based awards)

$$= \frac{\text{Non-Equity Performance-based + Equity Performance-based}}{\text{Discret. Bonus + Non-Equity Perf.-based + Equity Perf.-based + Equity Time-vesting}}$$

$$= \frac{5{,}000 + 7{,}574.818}{0 + 5{,}000 + 7{,}574.818 + 3{,}246.321 + 1{,}498.55}$$

$$= 72.60\%$$

Therefore 72.60% of the value of CEO awards in 2007 is tied to pre-specified targets.

We then identify the performance measures used in the performance-based awards and their respective weights. This information is usually located in the Compensation Discussion and Analysis Section, but sometimes one can also find it in the footnotes of the Grants of Plan-Based Awards Table or of the Summary Compensation Table.

We copy below two paragraphs of the Compensation Discussion and Analysis Section in which we identify the performance measures:

Annual Incentive Program

The Company sets business objectives at the beginning of each year that are reviewed by the Board of Directors. These objectives translate to targets for the Company and for each business unit for purposes of determining the target funding of the Annual Incentive Program. Actual funding levels can vary from 0% to 200% of target, depending on performance against objectives.

At the end of the year, management assesses the financial performance for the Company based on performance against financial metrics, as set out below.

FINANCIAL METRIC	WEIGHTING IN OVERALL SCORE
Net Income	60%
Revenue Growth	30%
Cash Flow	10%

Overall funding for the Annual Incentive Plan is based on the performance results against these targets and is typically not adjusted except for extraordinary events if deemed appropriate by the Chairman and CEO and Compensation Committee. This adjustment can be either up or down. For example, adjustments are usually made for large divestitures and acquisitions. In addition, an adjustment can be recommended by the Chairman and CEO based on factors such as individual and unit performance, client satisfaction, market share growth and workforce development, among others. The Compensation Committee reviews the financial scoring and qualitative adjustments and approves the Annual Incentive Plan funding level. Once the funding level has been approved, a lower-performing executive will receive as little as zero payout and the most exceptional performers are capped at three times target (payouts at that level are rare and only possible when IBM's performance has also been exceptional).

Performance Share Unit Program

EPS and cash flow targets for the Performance Share Unit program are set at the beginning of each three-year performance period, taking into account the Company's financial model shared with investors, including the impact our ongoing share buyback program has on EPS. At the end of the three years, the score is calculated based on results against the predetermined targets, with the following weights:

FINANCIAL METRIC	WEIGHTING IN OVERALL SCORE
Earnings Per Share (EPS)	80%
Cash Flow	20%

Adjustments can be made for extraordinary events if deemed appropriate by the Chairman and Compensation Committee — for example, large divestitures.

The accelerated stock repurchase and associated borrowing improved actual EPS results for 2007. Given that the Performance Share Unit Program is based on results for the period 2005-2007, the resulting effect on the program score was marginal.

The final score, which is approved by the Compensation Committee, adjusts the planned value of the actual Performance Share Unit award from 0% to 150%. There is no discretionary adjustment to the Performance Share program score.

Given this information, we can now compute the proportion of performance-based awards tied to the different performance measures. We first observe that IBM uses only accounting-based measures. Therefore, the proportion of performance-based awards tied to accounting (market)-based measures is 100% (0%). IBM uses three types of accounting measures: Income Measure (Net

Income and EPS), Revenue Measure (Revenue Growth), and Cash-Flow Measure. Below are the details of the calculations of their weights:

Among accounting measures, proportion of value of performance-based awards tied to measure X

$$= \left(\frac{\text{Non-Equity Performance-based Awards}}{\text{Non-Equity Perf.-based Awards + Equity Perf.-based Awards}}\right.$$

× weight of X in Non-Equity Performance-based Awards

$$+ \frac{\text{Equity Performance-based Awards}}{\text{Non-Equity Perf.-based Awards + Equity Perf.-based Awards}}$$

$$\left.\times \text{ weight of X in Equity Performance-based Awards }\right)$$

$$\times \frac{1}{\text{Proportion of value of Performance-based Awards tied to Accounting Measures}}$$

Therefore, we obtain the following weights:

$$\text{Income Weight} = \frac{5{,}000}{5{,}000 + 7{,}574.818} \times 60\% + \frac{7{,}574.818}{5{,}000 + 7{,}574.818} \times 80\%$$

$$= 72.05\%$$

$$\text{Revenue Weight} = \frac{5{,}000}{5{,}000 + 7{,}574.818} \times 30\% = 11.93\%$$

$$\text{Cash-Flow Weight} = \frac{5{,}000}{5{,}000 + 7{,}574.818} \times 10\% + \frac{7{,}574.818}{5{,}000 + 7{,}574.818} \times 20\%$$

$$= 16.02\%$$

We are also interested in the performance horizon used by IBM to set the performance goals. The performance horizon is 1 year for AIP and 3 years for PSU. We can now compute the performance horizon of CEO performance-based awards:

$$\text{Performance Horizon}$$

$$= \left(\frac{\text{Non-Equity Performance-based Awards}}{\text{Non-Equity Perf.-based Awards + Equity Perf.-based Awards}}\right)$$

$$\times \text{ Performance Horizon for Non-Equity Performance-based Awards}$$

$$+ \left(\frac{\text{Equity Performance-based Awards}}{\text{Non-Equity Perf.-based Awards + Equity Perf.-based Awards}}\right)$$

$$\times \text{ Performance Horizon for Equity Performance-based Awards}$$

$$= \frac{5{,}000}{5{,}000+7{,}574.818} \times 1 \text{ year} + \frac{7{,}574.818}{5{,}000+7{,}574.818} \times 3 \text{ years}$$

$$= 2.20 \text{ years}$$

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CHAPTER 3

THE DESIGN OF DIVISION MANAGERS INCENTIVE COMPENSATION CONTRACTS

3.1 Introduction

Division managers (DMs) are key elements in the well-functioning of an organization. In addition to supervising a subset of firm's activities, DMs are also crucial intermediaries in the information flow within the company. Misalignment in DM incentives could lead to not only weak division performance but also to sub-optimal capital allocation decisions across the entire company (Harris and Raviv, 1996, and Scharfstein and Stein, 2000). One important mechanism to control these incentive problems is the compensation contract. Yet, although there is an extensive literature on CEO compensation, little is known regarding how firms design DM compensation contracts.

Investigating DM incentives involves different challenges than examining CEO incentives. First, while the CEO is already at the top of the hierarchy, the DM can still climb the corporate ladder and potentially become the next CEO if he or she is performing well. These implicit incentives could play a significant role in designing DM incentives. Second, contrary to the CEO who is responsible for the overall firm performance, the DM bears direct responsibility only for the performance of his or her division. This creates a trade-off between using firm performance and division performance in designing DM compensation contract.

On the one hand, division performance is likely to be more informative of DM effort or actions. On the other hand, the use of division performance can create some adverse incentives such as to not collaborate with other divisions or to distort the information flow, in particular to exacerbate investment opportunities in his or her own division at the expense of the other divisions. Understanding how firms consider these issues and design DM incentive compensation contracts is the goal of this paper.

In December 2006, the Securities and Exchange Commission (SEC) issued disclosures rules on executive compensation, which require firms to provide additional information regarding the choice of contractual terms in executive compensation. I take advantage of these disclosure requirements and hand-collect information regarding the contractual terms that govern the level and types of DM incentives such as ownership requirements, target incentive compensation, and choice of performance measures with their assigned weights. I gather this information from the 100 largest companies in the U.S. in fiscal year 2007. However, compensation details need to be disclosed only for the top5 executives within the firm and thus not all firms publicly disclose DM compensation details. To identify DMs within the organization, I follow previous studies, such as Aggarwal and Samwick (2003), and classify executives who bear direct divisional responsibility among top5 executives as DMs. More than half of the sample firms have at least one DM among their top5 executives. In addition, the number of identifiable DMs varies across firms and, thus, to alleviate part of

the sample selection concerns, most of the analysis focuses on the top DM within the organization.

The first set of results is related to the level of incentives in DM contracts. In order to study the role of promotion-based incentives in the design of DM contract, I compare the level of contractual incentives provided to the DM and to the CEO (i.e. *the contractual incentive gap*). As mentioned in Baker, Jensen, and Murphy (1988), the fact that the CEO is at the top of the corporate hierarchy precludes the presence of any promotion-based incentives for the CEO. In addition, comparing DM incentives to CEO incentives also controls for potential firm fixed effects in the provision of employee incentives. While firms tend to provide significantly more contractual incentives to the CEO, the contractual incentive gap varies extensively across firms. I observe that on average the ownership requirements (target incentive compensation) are 3.5 (3.2) times higher for the CEO than for the DM. Furthermore, the ratios of ownership requirements (target incentive compensation) of the CEO to the DM vary from 1 to 6.6 (0 to 10.4). I find that both measures of contractual incentive gap are significantly and positively related to CEO age. Moreover, the gap tends to be greater in industries where new CEOs are likely to be recruited from within the firm. These results suggest that when the probability of promotion to CEO is lower, firms tend to provide greater contractual incentives to their DMs, which is consistent with the prediction that promotion-based incentives can act as a

substitute for contractual incentives (see Gibbs, 1995, and the discussion in the next section).

The second set of results is related to the type of incentives in DM compensation contracts. For that purpose, I study the pay-performance terms and measure how compensation incentives are tied to different performance measures, in particular firm performance and division performance. I observe that in general most of DM compensation incentives are associated with firm performance, whereas division performance captures only a small portion of DM incentives: on average 11% of the value of DM awards are explicitly associated with division performance (the median equals 8%). These results suggest that potential influence costs within the organization are high:[83] firms assign a large weight on firm performance in order to reduce DM adverse incentives to engage in influence activities or to distort information flow (Milgrom, 1988, and Meyer, Milgrom, and Roberts, 1992). Consistent with this argument, I also find that division performance-based incentives tend to be smaller in complex firms, when within-organization conflicts are potentially more severe. These findings further show that influence cost considerations are an important determinant of the design of DM contract.

[83] This finding is consistent with Wulf (2002) who investigates the effect of DM compensation incentives on capital allocation policies. She finds a negative relation between the sensitivity of division-investment to division-performance and firm performance-based compensation incentives. She interprets these results as supportive evidence of the presence of influence activities within the firm.

When agents face some common uncertainties, moral hazard in teams' models predict the use of relative performance evaluation in designing compensation contracts (see Holmstrom, 1982). In that case, inducing competition among their DMs would lead to more efficient incentives schemes within the organization. Although some firms explicitly benchmark firm performance to peer or market performance, I do not find evidence that firms use relative performance evaluation across divisions within the firm. This result also supports the argument that firms favor "team-play" practices in order to reduce DM adverse incentives. Moreover, it contrasts with the results in Aggarwal and Samwick (2003) who find some support in the presence of relative performance evaluation across divisions within the firm.[84]

In addition, my results show that the type of contractual terms do not vary across DMs. In most cases, the weights assigned to firm and division performance are identical across DMs within the organization. This result can be to some extent unexpected: recent results regarding network characteristics within the organization (Duchin and Sosyura, 2011), suggest that the influence or lobbying power across DMs would vary. If that is the case, it would be optimal to change the weight assigned to division performance across DMs. However, apart from potential deviations from optimal contracting, this result might just reflect the fact that contracting costs are high and, thus, firms use uniform contractual

[84] See De Angelis and Grinstein (2011) for an analysis and discussion regarding the informativeness of the choice of contractual terms in detecting the use of relative performance evaluation.

policies (instead of personalizing contractual terms for each DM) in order to reduce these costs.

This study adds to the incentive compensation literature in several ways. First, in the spirit of Kaplan and Stromberg (2003) and De Angelis and Grinstein (2012), this paper examines actual contracts and provides a snapshot of current practices as well as directly investigates the choice of contractual terms. Apart from studies that used proprietary data (although of only one firm or on a single-component of the DM contract),[85] past studies needed to estimate contractual choices from observed compensation outcomes. This methodology can be prone to identification problems due to nonlinearities in the payoff structure as well as be prone to sample selection issues due to matching difficulties across compensation and segment performance databases.[86]

Second, the examination of firm performance-based and division performance-based incentives sheds light on the importance of within-firm influence cost considerations in the design of DM contracts. Aggarwal and Samwick (2003) also study the presence of these two types of incentives in DM compensation; however, they do not consider influence costs explanations in their empirical framework.

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[85] See, for instance, Gibbs (1995) and Ederhof (2011) who use proprietary data from a single firm, and Wulf (2002) who uses survey data on annual bonuses.

[86] Aggarwal and Samwick (2003) are able to match only 46 percent of their DMs (among top5 executives) to segment information using the Compustat Segment database.

Finally, this paper also contributes to the debate regarding the interaction between promotion-based incentives and contractual incentives.[87] Even though there are theoretical arguments predicting a substitution effect between these two incentive mechanisms (Gibbs, 1995), only few papers aim to empirically disentangle these two types of incentives. Moreover, the existing evidence is mixed. Gibbs (1995) and Ederhof (2011) use proprietary data from a single large hierarchical corporation and reach opposite conclusions. Both studies focus on middle managers (3 to 6 ranks below the DM in my study) and their analysis is limited to a single firm. Thus, it is debatable whether their conclusions can be extended to higher-ranking managers, and to a larger sample.

The paper continues as follows. Section 3.2 develops the hypotheses. Section 3.3 provides a brief description of the disclosure requirements issued by the SEC as well as explains the data collection methodology. In Section 3.4, I describe and analyze the choice of the contractual terms in DM incentive compensation contracts. Section 3.5 concludes and proposes some directions for further research.

3.2 Development of the Hypotheses

In this section, I review theoretical arguments related to the design of DM contract. I focus on two aspects of the contract. The first one is the level of contractual incentives and its interaction with promotion-based incentives. The

[87] See also Gibbons and Murphy (1992) who study CEO implicit incentives from career concerns.

second aspect pertains to the trade-off between the use of firm-performance incentives and division-performance incentives in DM contract.

3.2.1 DM Contractual Incentives and Promotion-based Incentives

As shown in Gibbons and Murphy (1992), implicit incentives derived from the possibility of career advancement are expected to play a role in the provision of explicit contractual incentives. Implicit incentives in Gibbons and Murphy (1992) arise from the external labor markets; however, similar arguments can be made in the internal labor markets where implicit incentives arise from the possibility of being promoted within the firm. Indeed, a model by Gibbs (1995) formalizes this idea and predicts that under certain conditions promotion-based incentives will act as a substitute for contractual incentives.

To illustrate the intuition behind these predictions, here is a simple sketch of the model in Gibbs (1995). Consider a moral hazard problem where the firm employs a DM to execute a set of tasks, but the firm does not observe DM actions (only the outcome of DM actions, e.g. division and firm performance). The firm sets a compensation contract in order to induce the DM to exert effort and to maximize firm value. The DM has the following expected utility: $EU(e) = W(e) + P(e) \cdot \Delta - C(e)$ with $C'>0$ and $C''>0$.[88] The DM derives utility from his or her income ($W(e)$) and the option of being the next CEO ($P(e) \cdot \Delta$, where $P(e)$ is the probability of being promoted to CEO, and Δ is the utility derived from being promoted to CEO,

[88] For ease of exposition, in Gibbs (1995) model I assume that the expected level of ability is 1 (i.e. $\bar{\alpha} = 1$).

e.g. increase in wage, reputation, etc.). Both DM compensation and the probability of being promoted are positively associated to DM's level of effort, *e*. There is also a certain cost, *C(e)*, associated to his or her level of effort, which impacts negatively his or her utility. The compensation contract is a linear function of the firm's performance measure: $W(e) = b + \beta \cdot X(e)$, where b is DM base salary, β represents the sensitivity of compensation to performance (i.e. the level of contractual incentives), and X is a noisy performance measure: $X(e) = e + \varepsilon$, with $\varepsilon \sim N(0, \sigma_\varepsilon^2)$. It is important to note that in this model, firms can only design DM contract (i.e. choose b and β) and can not influence implicit incentives derived from the possibility of being promoted to CEO. As argued in Gibbs (1995), the hierarchical and organization structure is set (at least for the short run) and thus the probability function, *P(e)*, can be seen as quasi-exogenous (e.g. only one DM can be promoted to CEO, there is only one head of the segment and the span of firms' activities is a rather long-term decision, etc.). In addition, Gibbs (1995) also argues that the levels of expected wages are likely to be determined by external market forces and thus firms have limited ability to influence the prize associated to the CEO rank position.[89] The total incentives provided to the DM is captured by the sum of the contractual incentives, which are represented here by the sensitivity of compensation to performance (β), and the promotion-

[89] This last point contrasts with assumptions in tournament-type models such as the ones in Lazear and Rosen (1981) and Rosen (1986). In these models, the prize associated with promotion and thus the design of the hierarchical structure is one of the central choice variables. Indeed, empirical studies, such as Boganno (2001) and Kale, Reis, and Venkateswaran (2009), when deriving their empirical predictions abstract from the choice of the level of contractual incentives and focus only on the determination of the prize structure.

based incentives, which, in this case, are the product of the marginal effect of effort on the probability of being promoted times the utility derived from being promoted ($P'(e) \cdot \Delta$). It can then be shown that at the equilibrium the following condition holds: $\beta^* = 1 - P'(e^*) \cdot \Delta$. [90] In other words, under certain distributional conditions, it is optimal for the firm to provide lower contractual incentives when promotion-based incentives are greater. This represents the first hypothesis of this study.

H.3.1: In presence of greater promotion-based incentives, firms will provide lower contractual incentives.

According to the model, in order to identify cross-sectional variations in the level of promotion-based incentives, one needs to estimate either the marginal effect of effort on the probability of being promoted or the utility derived from (or the prize associated to) being promoted. These are difficult empirical tasks. In this paper, I use the probability of being promoted to gauge cross sectional variations in the level of promotion-based incentives.

Assume a standard promotion rule such that $P(e) = prob(e + \varepsilon > z) = 1 - F(z)$.[91] Under certain conditions, *P'(e)* increases in promotion probabilities (see Gibbs, 1995). For instance, if ε is distributed normally, then it can be shown that *P'(e)*

[90] If there is no promotion-based incentives (i.e. $P'(e*) \cdot \Delta = 0$), then $\beta^* = 1$ which is the standard result when both the principal and the agent are risk-neutral. One can then note that in the presence of promotion-based incentives, contractual incentives are lower (i.e. $P'(e*) \cdot \Delta > 0 \rightarrow \beta^* < 1$).

rises as P increases.[92] In other words, the level of promotion-based incentives increases as the probability of being promoted to CEO increases. As a result, H1 predicts that in firms in which it is more likely for the DM to be promoted to CEO, firms will provide lower contractual incentives.

3.2.2 Firm- and Division-Performance-based Incentives

While in the previous subsection I provide theoretical arguments regarding the level of incentives in the contract, here I focus on the types of incentives in the contract, and more precisely on the choice of performance measures. Consider again a moral hazard problem, but this time with a risk-averse DM as well as two performance measures, firm performance and division performance. According to the informativeness principle in Holmstrom (1979), performance measures that are more informative of DM actions (or effort) should bear larger weights in DM contract. Since the DM has complete oversight over division activities and does not bear overall corporate responsibilities (contrary to the CEO), on can argue that in general division performance should be a more precise measure of DM effort than firm performance. Firm performance includes performance of other divisions which are not under this DM's control, and hence will lead to a noisier signal of DM effort. Therefore, division performance should bear a larger weight in DM contract. Note that if divisions' activities within the firm are not

[91] The standard rule is used for the sake of simplicity. Similar conclusions can be reached under a tournament version of this model, such that there are multiple DMs and only the one with the best performance can be promoted. See Gibbs (1996) for a detailed discussion and derivation.

independent (i.e. the firm activities are to some extent integrated), then other divisions' performance might be informative of DM effort.[93] It follows that greater level of integration of firm's activities should lead to greater weight placed on firm performance in DM contract.

However, there exists a second rational for the use of firm-performance in DM contract, namely the adverse incentive costs associated with tying compensation to division performance, which is the focus of my second hypothesis. DMs with private information about their divisions may distort the information flow within the organization for their own benefits (see Milgrom, 1988, and Meyer, Milgrom, and Roberts, 1992, for arguments related to influence activities within the firm). For instance, in order to attract a larger fraction of firm's budget, DMs might exacerbate investment opportunities in their own division at the expense of the other divisions in the firm. A larger weight on division-performance will exacerbate DM rent-seeking behavior while a larger weight on firm-performance will mitigate these adverse incentives.[94] Precisely, if the DM distorts the information flow and thus distorts firm investment policy, firm performance will decrease. Hence, if firms tie DM compensation to firm-performance, DM compensation will decrease if he or she engages into influence activities.

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[92] This holds as long as P is less than 0.5 – it is realistic to assume that the unconditional probability of promotion is less than 0.5 (Gibbs, 1995). The level of promotion–based incentives would be highest at P=0.5.

[93] See results in Bushman, Indjejikian, and Smith (1995) regarding the use of aggregate performance measures when there are intrafirm interdependencies. See also Keating (1997).

[94] See Wulf (2002) for a study of the interplay between incentives arising from the budgeting decision and incentives from compensation.

In other words, there exists a tradeoff between tying compensation to division-performance versus firm-performance. While division-performance might be a more precise measure of DM effort, firm-performance will increase DM private cost to engage into influence activities.

H.3.2: Firms that are more vulnerable to within-organization conflicts will assign a smaller (larger) weight to division-performance (firm-performance) in DM contract.

When DMs in the firm face some common uncertainties, it would be optimal to benchmark division performance to the performance of the other divisions in the firm (Holmstrom, 1982). In that case the use of relative performance evaluation would lead to more efficient contractual terms. However, analogously to the previous argument, the use of relative performance evaluation could exacerbate DM adverse incentives. Relative performance evaluation would directly induce competition among the DMs and, thus, DMs have now some incentives to reduce the performance of the other divisions. Hence I expect firms in which within-organization conflicts are more severe to rely less on relative performance evaluation in DM contract.

H.3.3: Firms that are more vulnerable to within-organization conflicts are less likely to use relative performance evaluation across their divisions.

3.3 Methodology and Data

3.3.1 2006 Executive Compensation Disclosure Rules and Data Collection

In this paper, I take advantage of the 2006 Compensation Disclosure Rules to collect detailed information regarding the terms in DMs contracts. These disclosure rules were issued by the SEC in order "*... to provide investors with a clearer and more complete picture of compensation to principal executive officers*" (see Background and Overview Section in the SEC Release Nos. 33-8732A). Among the new requirements, firms are now required to provide detailed information regarding their choices of performance measures along with their assigned weights, payouts and target goals.[95] Firms are also now required to disclose and discuss any ownership requirement.

The data collection methodology is similar to the one employed in De Angelis and Grinstein (2012). I gather information from the 2008 proxy statements (i.e. for fiscal year 2007) and identify the performance measures used in DM contract along with their assigned weights. I collect these performance terms in the performance-based awards granted to the DMs. This allows me, for instance, to disentangle the fraction of DM awards tied to firm performance and division performance. I use the expected value of these awards (i.e. the payout of the awards if the target performance is achieved) to compute the fraction of awards

[95] See De Angelis and Grinstein (2012) for a detailed discussion regarding these new requirements and the data collection methodology.

tied to different performance measures. In addition, I also collect information regarding the ownership requirements for the DMs and the CEO.

De Angelis and Grinstein (2012) show that these disclosure requirements are binding and that firms provide more detailed compensation information subsequent to these rules. They also show that this new data is informative and that the contractual terms are binding.

3.3.2 Data

3.3.2.1 Sample Selection and Identifying the DMs

The initial sample represents the 100 largest companies (in terms of market capitalization) in the U.S. in fiscal year 2007. However, compensation details need to be disclosed only for the top5 executives within the firm and thus not all firms publicly disclose DM compensation details. This data limitation has already been encountered in past studies (see, e.g., Aggarwal and Samwick, 2003). To identify DMs within the organization, I follow previous studies, such as Aggarwal and Samwick (2003), and classify executives who bear direct divisional responsibility among top5 executives as DMs. In figure 3.1, I report the distribution of the number of identifiable DMs by firm.

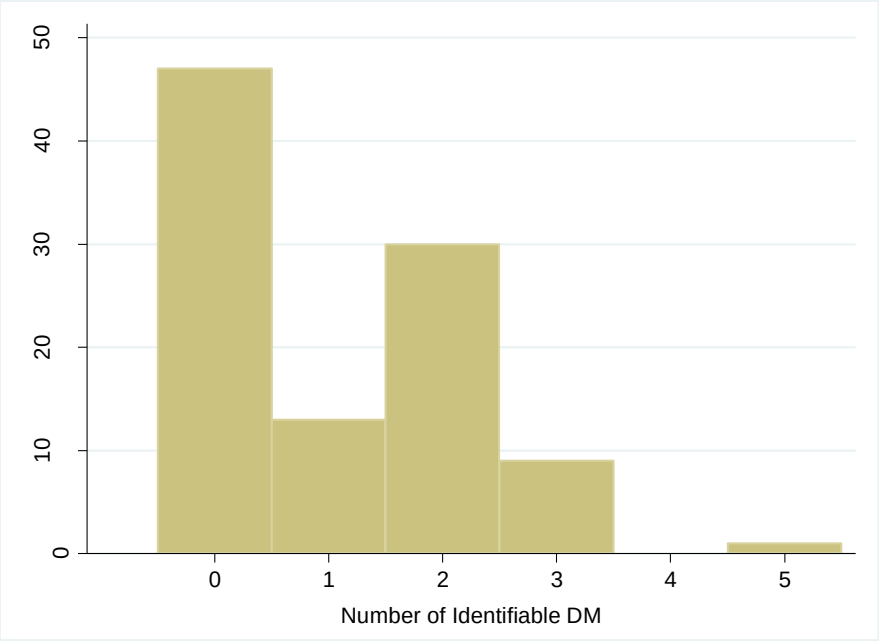
In my initial sample, 47 firms do not have at least one identifiable DM among their top5 executives.[96] These firms are dropped out of the final sample. The

[96] Aggarwal and Samwich (2003) report that 19% of the top 5 executives in their sample have divisional responsabilities. This represents about 0.95 DM per firm on average, which is similar to 1.05 DM per firm on average in my sample.

number of identifiable DMs varies across firms. Most of the analysis focuses on the top DM within the organization. The DM who is granted the largest total awards is classified as the top DM. The focus on only the top DM has the advantage to alleviate part of the sample selection concerns owing to the variations of the number of identifiable DMs by firm. Finally, due to non-identifiable contractual terms and missing variables, the sample size in the regression analysis varies from 38 to 52 firm observations.

Figure 3.1. Distribution of the number of identifiable division managers by firm

Figure 3.1 represents the distribution of the number of identifiable DMs per firm.



3.3.2.2 DM Compensation

There are two kinds of awards granted to DMs: time-vesting equity awards and performance-based awards (i.e. vest conditional on reaching a certain level of

performance). The value of time-vesting equity awards is by design associated to firm performance and stock price performance. Performance-based awards, on the other hand, are associated to various performance measures (the performance terms are collected from these awards: most of the performance-based awards tend to be associated to firm performance and accounting performance – see section 3.4.1 and the results in Table 3.3). In Table 3.1, I report the distribution of the different types of awards in DM compensation for fiscal year 2007.

On average, each type of awards represents approximately half of the value of the total awards. For performance-based awards, I consider the expected value of the awards (i.e. the target payout). The payout of performance-based awards can be in cash, stock or options. Most firms tend to grant some cash performance-based awards: 47 firms grant some annual cash incentives plan and 18 firms grant some long-term cash incentives plan. The expected payouts for the long-term cash incentives plan tend to be greater than the ones for the annual cash incentives plan: 1.4 million dollars on average for the long-term plan while only 1.1 million dollars on average for the annual plan. Equity performance-based awards tend to given in the form of stock awards: 29 firms grant some stock performance-based awards while only 2 firms grant some option performance-based awards. On the other hand, among time-vesting awards, options awards tend to be predominant: 43 firms grant some options awards while only 34 firms grant some stock awards.

Table 3.1. Division manager compensation

Table 3.1 describes DM base salary and the different components of DM awards granted in fiscal year 2007. I report the numbers of firms that grant the different types of awards as well as the summary statistics of the (target) value of these awards in thousands of dollars (for firms that grant these awards).

Base salary and awards granted to the top division manager in 2007

	# Firms with component > 0	Stats for firms with component > 0 (in k$)		
		Mean	Median	SD
Base Salary	53	709	692	233
Performance-based Awards	50	2576	2089	2051
- *Annual Cash Incentives Plan*	47	1123	749	1522
- *Long-term Cash Incentives Plan*	18	1438	1213	1079
- *Stock Awards*	29	1708	1450	1386
- *Option Awards*	2	265	265	53
Time-vesting Awards	50	2704	1926	2628
- *Stock Awards*	34	2477	1251	2916
- *Option Awards*	43	1582	1420	1545
Total Awards *(excluding Base Salary)*	53	5302	4440	3477

3.3.2.3 Independent Variables

I use several explanatory variables to study the determinants of the design of DM contract. The number of business segments is a proxy for the complexity of firm's activities as well as for the vulnerability of the firm to within-organization conflicts (Stein, 1997). I also use the natural logarithm of a firm's assets to measure firm size and the natural logarithm of firm age (defined by the year the firm was founded) to capture firm maturity. I employ two different variables to

measure the probability of promotion to CEO. The first one is the natural logarithm of CEO age at the end of 2007. Older CEOs are more likely to retire soon. The second variable is the proportion of new CEOs who received an internal promotion (i.e. CEOs who were already employed by the firm as opposed to an external hiring) among all new CEOs in the same industry between 1993 and 2005. In industries with larger proportions, it is more likely that an insider will become the next CEO and, thus, the perceived probability of promotion to CEO is higher. I collect this information from Table 3 in Cremers and Grinstein (2011). The last variable is the fraction of outstanding shares held by outside shareholders who hold more than 5% of the total number of shares outstanding. This variable captures ownership concentration and will be used as a control variable in this study. Past studies, such as Bertrand and Mullainathan (2000), have shown that ownership characteristics are important determinants of executive compensation policies. The data for the independent variables are extracted from Compustat and Corporate Library. The explanatory variables are from fiscal year 2006 (unless stated otherwise). Table 3.2 provides some basic descriptive statistics of the independent variables. Sample firms represent the largest firms in the US with total assets of approximately 60 billion dollars in 2006 on average. They also tend to be complex with multiple lines of business: the average (median) number of business segments is 3.25 (3). In addition, the sample firms are also very mature: on average they have been running for at least 62 years. The CEO is on average 58 years old and the proportion of insiders

among new CEOs is on average 68%. The standard deviations of these two variables are 5 and 12% respectively, which suggest that the perceived probability of promotion to CEO varies greatly across the sample firms.

Table 3.2. Independent variables: Descriptive statistics

Table 3.2 provides descriptive statistics of the independent variables used in this study. The explanatory variables are from fiscal year 2006 (unless stated otherwise). # Bus. Seg. represents the number of business segments. Log Assets is the natural logarithm of a firm's total assets (in millions dollars). Firm Age is equal to 2007 minus the year the firm was founded. CEO Age is the age of the CEO at the end of fiscal year 2007. Prop. Insider among New CEO represents the proportion of insiders from the same industry among all new CEOs for each industry between 1993 and 2005 (Cremers and Grinstein, 2011). Block Ownership is the ratio of shares held by the shareholders who held more than 5% of total number of shares outstanding to the number of shares outstanding.

Independent variables: Descriptive statistics				
	Mean	Median	SD	# obs
# Bus. Seg.	3.25	3.00	2.12	52
Log Assets	11.00	11.70	1.25	52
Firm Age	62.33	53.50	46.29	52
CEO Age	57.88	58.00	5.23	52
Prop. Insider among New CEO	68%	69%	12%	52
Block Ownership	10%	6%	15%	52

3.4 Empirical Analysis

3.4.1 Terms of DM Incentive Compensation Contracts

In Table 3.3, I report the summary statistics regarding the terms of DM incentive compensation contracts, such as the level of ownership requirements, the type of performance measures as well as the length of the performance horizon used in the performance-based awards.

Table 3.3. Contractual terms of division manager incentive compensation

Table 3.3 describes the terms in DM contract. Panel A reports summary statistics regarding ownership requirement. Panel B and D report the number of firms using different types of performance measures as well as basis statistics regarding the weight associated with these measures. Panel C provides basic statistics about the performance-vesting horizon.

Panel A: Ownership requirement for the top division manager				
	# Firms with requirement	Stats (in k$)		
		Mean	Median	SD
Ownership requirement	45	2814	2400	1487
Panel B: Firm- and division-performance-based incentives				
# of firms with identifiable performance terms				38
	# Firms with performance terms	Associated weight among users		
		Mean	Median	SD
Firm-performance	36	82%	83%	19%
- *Annual Cash Incentives Plan*	28	65%	50%	28%
- *Long-term Cash Incentives Plan*	17	100%	100%	0%
- *Stock Awards*	23	97%	100%	10%
- *Option Awards*	2	100%	100%	0%
Division-performance	28	32%	25%	25%
- *Annual Cash Incentives Plan*	27	69%	60%	24%
- *Long-term Cash Incentives Plan*	0	N/A	N/A	N/A
- *Stock Awards*	2	33%	33%	11%
- *Option Awards*	0	N/A	N/A	N/A
Panel C: Performance horizon				
	# Firms	Mean	Median	SD
Performance horizon	38	2.05	2.29	0.63
Panel D: Type of performance measures				
	# Firms with performance terms	Weight among users		
		Mean	Median	SD
Stock price	13	41%	39%	21%
Accounting performance	38	77%	88%	25%
Non-financial measures	23	14%	9%	17%
Relative performance evaluation				
- *Firm Performance*	16	41%	37%	22%
- *Division Perf. (within the firm)*	0	N/A	N/A	N/A

I can identify the level of ownership requirements for 45 firms and the type of performance measures with their assigned weights for 38 firms. On average firms require their top DM to hold 2.8 million dollars worth of shares. The median value is 2.4 million dollars. These ownership requirements vary extensively across firms: the standard deviation is 1.5 million dollars. Most firms use firm-performance terms in the performance-based awards (36 firms out of 38). When they use firm-performance terms, they assign on average 82% of the expected value of the performance-based awards. Many firms also tie explicitly vesting conditions to division performance (28 firms out of 38). Division-performance terms tend to be used mostly in annual cash incentives plan. Only 2 firms use division-performance terms in their stock performance-based awards. By consequence, division-performance terms tend to be over one year performance horizon. When they use division-performance terms, firms assign on average 32% of the expected value of the performance-based awards. The weights assigned to division-performance tend to vary across firms: the standard deviation is 25%.

I also observe that on average firms employ a 2 year performance horizon in DM contractual terms. Firms tend to favor the use of accounting-based performance measures over stock-based performance measures. This result is consistent with results regarding CEO contractual terms (see De Angelis and Grinstein, 2012). It is also consistent with results in Bouwens and Lent (2007) who use survey data

and document that stock-based performance measures play a minor role in determining annual bonuses of business managers in the Netherlands.

I find that 16 firms (out of 38) use relative performance evaluation when assessing firm performance. In other words, about 42% of the sample firms explicitly benchmark firm performance. On the other hand, no firm uses relative performance evaluation when assessing division performance. Hence I can not directly test H3 since there is no cross sectional variation in the use of relative performance evaluation across firm's divisions. However, this last result suggests that firms do not explicitly induce competition among their divisions and is consistent with the notion that influence costs are an important consideration within the organization.

Even though the main analysis is focused on the top DM, I also collect information regarding the other DMs (when information is available, see Figure 1). On the one hand, I find that levels of contractual incentives vary across DMs: out of the 40 firms which exhibit two or more identifiable DMs, 36 firms grant awards with different (expected) value across their DMs. On the other hand, the performance terms tend to be similar across different DMs within the company: only one firm in my sample use different performance terms (i.e. weights assigned to firm and division performance) across their DMs.

3.4.2 DM Contractual Incentives and Promotion-based Incentives

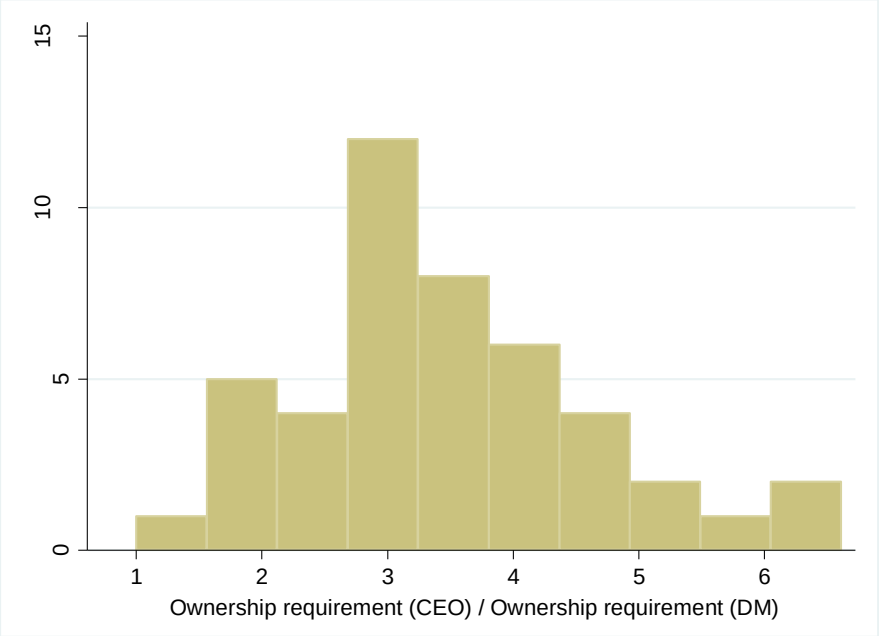
In this subsection, I aim to investigate the interplay between incentives present in DM contract and promotion-based incentives in place. In that respect, I measure the contractual incentive gap between the CEO and the top DM. Since the CEO is at the top of the corporate hierarchy, it precludes the presence of any promotion-based incentives for him or her (Baker, Jensen, and Murphy, 1988). I use the ratio of CEO contractual incentives to DM contractual incentives. Firms with greater ratios provide lower contractual incentives to their top DM (relative to their CEO). In addition, another advantage of employing this ratio is that it controls for potential firm fixed effects in the provision of employee incentives. To estimate the level of contractual incentives, I use two different measures. The first one is the level of ownership requirements. The second measure is the expected value of all awards granted to the agent. Higher ownership requirements or more awards increase the level of contractual incentives as well as signal more willingness to tie the agent's wealth to shareholders' interests. The distributions of the two measures of contractual incentive gap are reported in Figure 3.2.

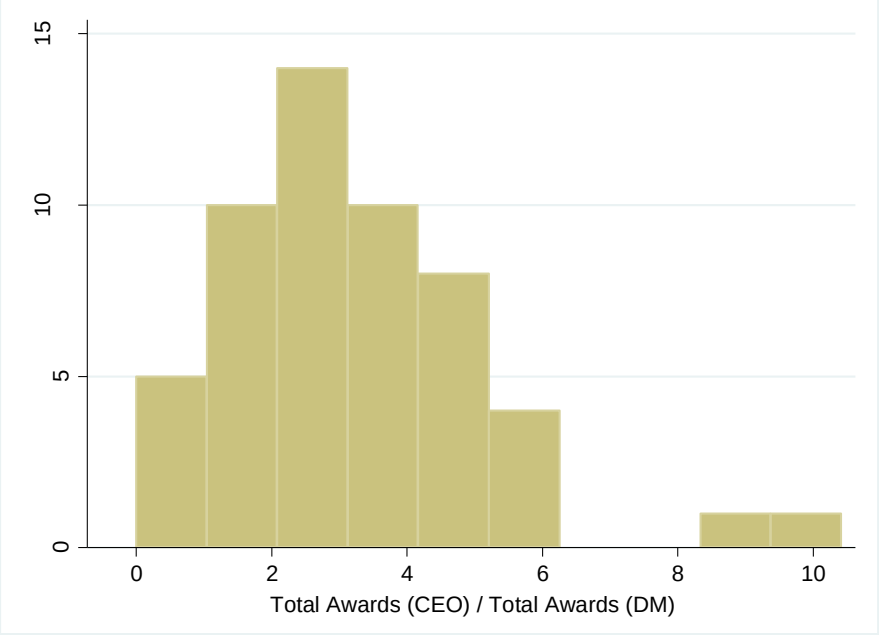
Firms tend to provide significantly more contractual incentives to the CEO. I observe that on average the ownership requirements (target incentive compensation) are 3.5 (3.2) times larger for the CEO than for the DM. The contractual incentive gap varies extensively across firms and the two

distributions are close to normal-shaped. The ratios of ownership requirements (total awards) of the CEO to the DM vary from 1 to 6.6 (0 to 10.4).

Figure 3.2. Distribution of the Contractual Incentive Gap

Figure 3.2 represents the distributions of (i) the ratio of CEO ownership requirement to DM ownership requirement, and (ii) the ratio of CEO total awards to DM total awards.





I then investigate the determinants of these cross-sectional variations. Using OLS regressions, I study the relationship between these ratios and the perceived probability of promotion to CEO. According to the promotion-based incentives hypothesis (H1), I expect a positive relationship. In other words, when it is more likely for the DM to be promoted to CEO, I expect firms to provide less contractual incentives to their DM relative to their CEO (i.e. a higher ratio). The results are reported in Table 3.4.

Table 3.4. Determinants of the Contractual Incentive Gap

Table 3.4 shows results of OLS regressions. The dependent variables are the ratio of CEO ownership requirement to DM ownership requirement, and the ratio of CEO total awards to DM total awards. The independent variables are defined in Table 3.2. Robust standard errors are reported in parentheses. The symbol *** indicates that the p-value is less than 0.01, ** that it is less than 0.05, and * that it is less than 0.1.

	Ownership requirement (CEO) / Ownership requirement (DM)		Total Awards (CEO) / Total Awards (DM)	
VARIABLES	(1)	(2)	(3)	(4)
Log CEO Age	3.43*	3.76**	7.91*	8.43**
	(1.78)	(1.78)	(4.01)	(3.98)
Prop. Insider among New CEO	1.68	1.52	1.51	1.30
	(1.26)	(1.33)	(2.04)	(1.91)
Block Ownership		1.69**		3.16**
		(0.76)		(1.23)
Constant	-11.60	-12.99*	-29.84*	-32.15*
	(6.99)	(7.00)	(16.22)	(16.11)
Observations	45	45	52	52
R-squared	0.110	0.160	0.154	0.217

There is a positive and significant relationship between both ratios of incentives gap and CEO age.[97] In firms with older CEOs (i.e. more likely to retire soon), firms provide less contractual incentives to their DMs. Although not significant, the coefficient of the proportion of insiders among new CEOs is also positive, which is consistent with the promotion-based incentives hypothesis (H1). DM contractual incentives tend to be lower in industries where new CEOs are likely to be recruited from within the firm. The results are robust to the addition of ownership characteristics, which exhibit a positive and significant coefficient. These results suggest that when the probability of promotion to CEO is lower, firms tend to provide greater contractual incentives to their DMs, which is consistent with the prediction that promotion-based incentives can act as a substitute for contractual incentives.

3.4.3 Division-Performance-based Incentives

In this subsection, I measure the level of division-performance incentives in DM contracts as well as study the determinants of the presence of these incentives. As discussed previously, some of the performance terms are associated directly to division-performance while other performance terms are tied to firm-performance. To measure the level of division-performance incentives in DM contract, I estimate the portion of the contract that is directly associated to

[97] Using the outcome of compensation (i.e. the amount paid ex-post and not the expected value ex-ante) and looking at all the executives, Boganno (2001) and Kale, Reis, and Venkateswaran (2009) find a negative relationship between pay gap and CEO age. They view the pay gap as a lottery prize that could be won if promoted to CEO rank and investigate implications from corporate tournament theories (Lazear and Rosen, 1981).

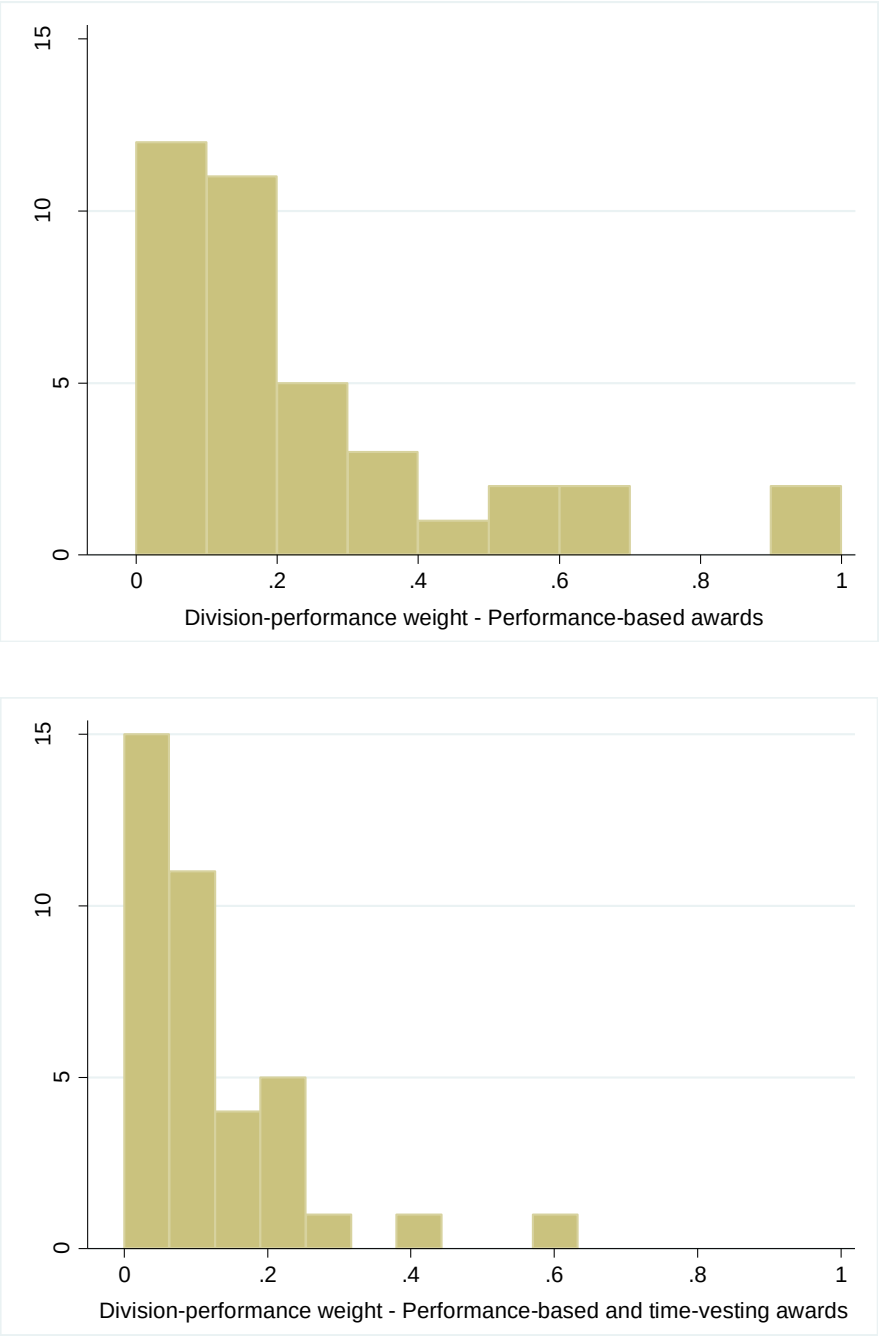
division-performance. I first compute the value-weighted average of the performance measures associated to division-performance across all performance-contingent awards. Therefore, in the instance of multiple performance-based awards, for each award I identify the portion of performance terms tied to division-performance, and then use the expected value of these awards to compute the value-weighted average.[98] Then I also take into account time-vesting awards, which are by definition associated to firm-performance, and compute the value weighted average across all the awards granted to the DM. I use two measures, one considering only the performance-based awards, and the second one considering both performance-based awards and time-vesting awards. I report the distribution of these two measures in Figure 3.3.

Both distributions are right-skewed with a mass of observations close to zero. When considering only performance-based awards, the mean is 25%, the median is 17%, and the values range 0 from to 100%. When considering both performance-based awards and time-vesting awards, the mean is 11%, the median is 8%, and the values range from 0 to 63%.

[98] In the case of performance-based stock awards, this measure represents an upper-bound of the portion of the value of the awards associated to division-performance since the value of the stock is associated to firm performance. However, only two firms grant performance-based stock awards and use division-performance terms (see Table 3.3) and, thus, this potential over-estimation is limited.

Figure 3.3. Distribution of explicit division-performance-based incentives

Figure 3.3 represents the distributions of the value-weighted average of the performance measures associated to division-performance across (i) all DM performance-contingent awards and (ii) all DM awards.



These two distributions show that division-performance incentives play a minor role in DM contractual incentives and that firms tend to favor firm-performance incentives. These results along with the non-use of relative performance evaluation across divisions within the firm are consistent with the notion that influence activities are important considerations in the design of DM contracts.

Even though I measure that the portion of DM contract associated to division-performance is low, it is difficult to conclude that these low estimates are the result of influence activities considerations and adverse costs associated with the use of division-performance. For that purpose, I study the determinants of the level of division-performance incentives. I regress the portion of DM contract associated to division-performance to several firm characteristics such as the number of business segments, firm size and firm age. The results are reported in Table 3.5.

Since both measures of division-performance incentives are bounded between zero and one, with a mass of observations at zero, I use Tobit regressions. The coefficient of the number of business segments is negative and significant. The coefficients of the other explanatory variables are not significant. The results are robust to the addition of ownership characteristics as well as to the use of OLS regression. These results are consistent with the influence activities hypothesis (H2). Firms with more business segments are more vulnerable to within-organization conflicts (Stein, 1997) and thus avoid the use of division-performance incentives due to the adverse costs associated with them. These

results confirm that influence activities considerations are important factors in firm's compensation policy.

Table 3.5. Determinants of the Use of Explicit division-performance-based incentives

Table 3.5 shows results of Tobit and OLS regressions. The dependent variables are the value-weighted average of the performance measures associated to division-performance across all DM awards, and the value-weighted average across all DM performance-contingent awards. The independent variables are defined in Table 3.2. Robust standard errors are reported in parentheses. The symbol *** indicates that the p-value is less than 0.01, ** that it is less than 0.05, and * that it is less than 0.1.

	Dep. Var.: Weight assigned to division performance					
	Total Awards			Perf.based Awards		
VARIABLES	Tobit	Tobit	OLS	Tobit	Tobit	OLS
# Bus. Seg.	-0.02*	-0.02*	-0.02**	-0.03	-0.04	-0.03*
	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)
Log Assets	0.01	0.01	-0.00	0.00	0.00	-0.02
	(0.02)	(0.02)	(0.01)	(0.05)	(0.05)	(0.04)
Log Firm Age	-0.02	-0.02	-0.02	-0.03	-0.03	-0.02
	(0.03)	(0.03)	(0.02)	(0.06)	(0.06)	(0.04)
Block Ownership		0.01	-0.01		-0.08	-0.11
		(0.13)	(0.11)		(0.23)	(0.19)
Constant	0.18	0.18	0.27	0.39	0.41	0.58
	(0.27)	(0.26)	(0.22)	(0.63)	(0.61)	(0.52)
Observations	38	38	38	38	38	38
R-squared			0.107			0.070

3.5 Conclusion and Further Research

In this paper, I investigate how firms design DM incentive compensation contracts. I take advantage of disclosure requirements issued in 2006 by the SEC and hand-collect information regarding the contractual terms that govern the

level and types of DM incentives, such as ownership requirements, target incentive compensation, and choice of performance measures with their assigned weights.

The analysis is twofold. First, I investigate the level of incentives present in DM contracts and whether firms consider the presence of implicit incentives when designing the contract. I find that when the probability of promotion to CEO is lower, DM ownership requirements are more stringent and DM compensation incentives are greater, which suggest that firms take into account promotion-based incentives when setting the level of DM contractual incentives.

Second, I study the pay-performance terms and measure how compensation incentives are tied to firm performance and division performance. I find that most of DM compensation incentives are associated with firm performance, whereas division performance captures only a small portion (11% on average). In addition, division performance-based incentives tend to be smaller in complex firms, when within-organization conflicts are potentially more severe. Furthermore, I do not observe the use of relative performance evaluation across divisions. Overall, these results support the argument that influence costs are important considerations in designing DMs contracts (Milgrom, 1988, and Meyer, Milgrom, and Roberts, 1992) and suggest that firms assign a large weight on firm performance in order to reduce DM adverse incentives to engage in influence activities or to distort information flow.

To further understand how firms design DM incentive compensation contracts, it would be interesting to study the interplay between monitoring technologies and DM contractual incentives. For instance, better monitoring technologies would reduce DM's ability to manipulate information flow and, thus, one would expect that firms will increase the weight associated to division performance (i.e. decrease the weight associated to firm performance) in DM contract. Findings in my first essay (De Angelis, 2011) can be related to this argument and are encouraging regarding the importance of monitoring technology in the inner workings of the firm.[99] Finally, as mentioned recently in Fernandes, Ferreira, Matos, and Murphy (2012), few studies have examined international differences in the structure of executive pay. Non-US firms tend to exhibit different ownership and board characteristics,[100] which are likely to lead to different implicit incentives in place than the ones in US firms. For instance, in family- or government-controlled firms, CEO succession might already be planned or the result of political games, which would considerably limit promotion-based incentives. Using international data and taking advantage of cross-country governance variations could help to further shed light on the effect of promotion-based incentives in setting the level of contractual incentives.

[99] Results in De Angelis (2011) suggest that monitoring technologies have a direct effect on the extent top management rely on accounting performance reported by the DMs in capital allocation decisions.

[100] For instance, firms in continental Europe tend be more controlled by a family or the State (see La Porta, Lopez-de-Silanes, Shleifer, and Vishny, 1999).

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